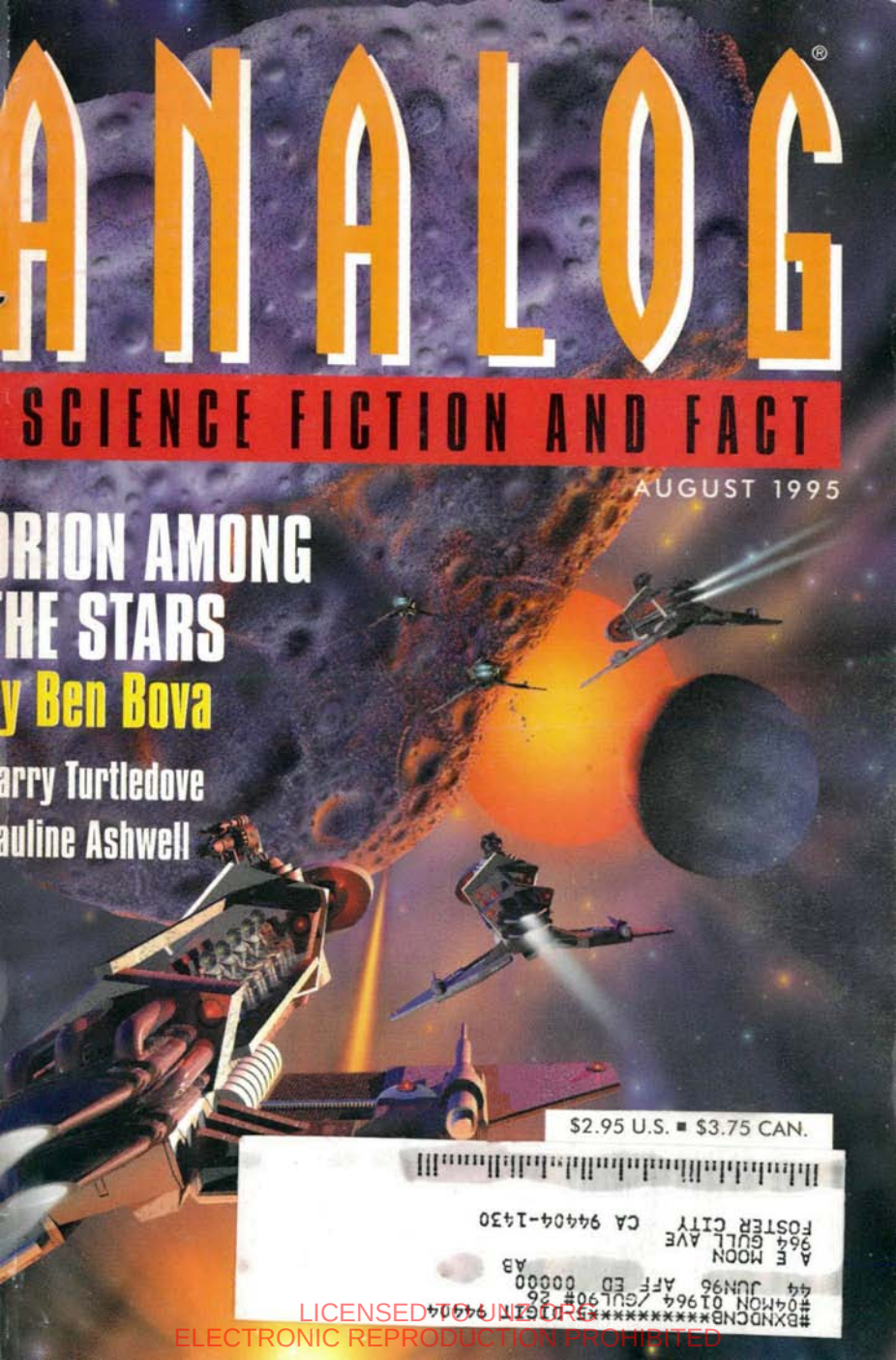

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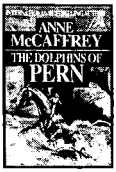

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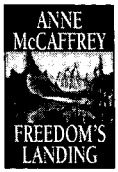

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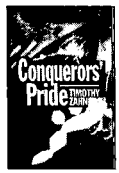

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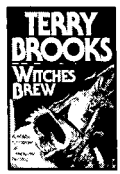

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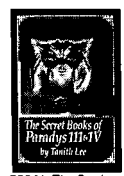

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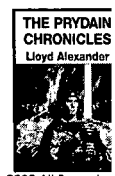

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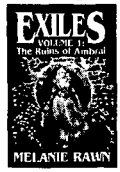

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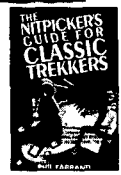

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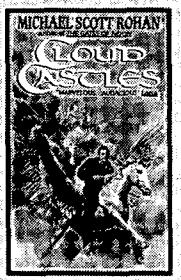

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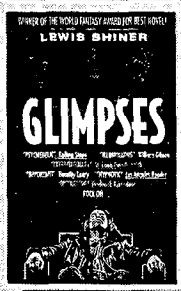

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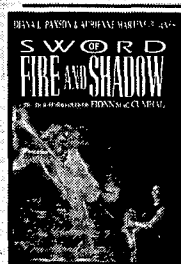

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EDITORIAL Stanley Schmidt

THE ANONYMOUS SOCIETY

I recently received an interesting letter from a reader named Charles Hart (Or is it? Even he expresses doubt . . .) congratulating *Analog* on having "joined the computer communication revolution" by getting and publishing an e-mail address. "Some despair at the demise of the well-written paper letter," the alleged Mr. Hart allegedly writes, "I simply note that many claims at the bar have foundered for the very lack of such writings and no prudent business individual would today commit to paper their actual position should it vary in the slightest from a politically correct one.

"Thus the proliferation of electronic messaging, where the very lack of security in the message is a form of security. After all, even with this message on CIS through their fine e-mail system, how do you *really* know it came from me?"

I don't, of course, though I suspect it did; whoever wrote the message *sounds* like a forthright and honest chap. At least he did sign a name, which I can at least tentatively assume is his real one, and give an e-mail address (though no other kind). So henceforth I'll just call him Mr. Hart.

I agree with Mr. Hart that having and using e-mail is a good thing, though my enthusiasm is not quite as wholehearted and unalloyed as some people's. I've never been much for seizing new technologies just because they're there, and immediately thinking they're the solution to all problems. My preferences are more selective. I try to keep an eye on as many new technologies as possible, and use those that (a) help me do things I want to do, and (b) enable me to do them *better* than older technologies.

What e-mail can do better, at least in principle, is convey messages with the precision and concreteness of a letter and the speed of a telephone call. It's great, for example, when I'm trying to get all the revisions into an article in time to meet a tight deadline. However, relatively few communications really have that kind of urgency, and a method that practically forces haste on you may not be the best medium for messages that don't.

E-mail by no means guarantees that you'll *always* combine maximum speed with maximum accuracy or precision of expression. In practice,

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it often seems to encourage speed at the *expense* of expressive quality. People who spend much of their lives at keyboards connected to modems tend to fire off whatever pops into their heads, right away, simply because it's so easy to do so. The fact that it makes communication quick and easy is a real advantage, up to a point. As an editor, I appreciate all the feedback I can get from readers, and I welcome the additional input I now receive from readers who might not bother to comment if they had to do it on paper. But quick and easy is not always an unmixed blessing.

It's too easy to "flame" online; as Rick Cook and Pete Manly discussed in their article "Cyberspaced Out: Manners and Mores in the Global Village" (*Analog*, April 1992), people behave differently online than in person. E-mail also makes it too easy to generate reams of letters that aren't really worth writing or reading (though at least they're easy to dispose of!). I don't "despair of the demise of the well-written paper letter" as an art form or a tradition, but it *is* sometimes a better means of communication. Often communication benefits from people taking the time to ask themselves, "Is this message really worth the time and effort to write and read it?" and "Have I worded it as well as I should?" "Snail mail" strongly encourages people to do those things. So I see e-mail not as a *replacement* for regular mail, but as a valuable supplement to it. I use each in those situations where it seems best suited to my needs.

The drawback of electronic communication that most concerns me now is not its encouragement of undue haste and logorrhea, but its tendency to encourage anonymity. I've already mentioned Cook and Manly's observation that people will say things to each other online that they wouldn't say face to face. I've also quoted Mr. Hart's observation that business people today will often use e-mail preferentially because it makes it so easy to say things without later having to own up to them.

And I'm not at all sure that's a healthy thing.

Anonymity, and its variations such as hiding behind a pseudonym, are not new, of course. They existed long before the "Information Superhighway," and they have important and valuable places in a civilization's functioning. Some authors have excellent reasons for using pseudonyms, such as living in a totalitarian state that would frown, perhaps lethally, on

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their writings. Many public figures quite wisely avoid publicizing their home addresses and phone numbers; they are too likely to attract the attention of nuts, and people who have legitimate business with them can contact them through legitimate channels such as their agents or employers. Democracy depends on secret ballots, so that citizens can express their wishes without fear of retaliation by those they didn't vote for. Statistical polls can provide valuable information on what really goes on in a society as a whole, and people are more likely to provide honest data if they know they won't later be tried or ridiculed for it. Individuals need and deserve privacy—the right to do things with their own lives that are not subject to scrutiny by others. Protecting that right against increasingly easy invasion is one of the major challenges we face in assimilating new communication technologies.

But there are borderline cases in which it's harder to be entirely comfortable with anonymity. There's no reason why I should expect you to tell me everything you do in your own home (or vice versa). But if one of us is doing something for or to the other, it's quite reasonable for both to want to know with whom they're dealing. Customer service representatives in businesses often respond to customer complaints with form letters signed with a house name. I've always found that idea a bit disturbing, partly because a customer who has to complain more than once about the same problem would like to know that he's always talking to the same person, and partly because people who have

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to sign their work and stand behind it are more likely to do work worth signing and standing behind.

But there's a corollary of *that* related to the fact that the nuts seem to be proliferating. I once mentioned my "work worth signing" concern to somebody at a company that handled complaints under house names, and was told that this was necessary because people handling complaints not infrequently receive threats, up to and including bodily harm. In principle, I stand behind my claim that people are more likely to do high-quality work if they take personal responsibility for it. In practice, there are limits to how much abuse and possibly even danger we can reasonably expect people to expose themselves to in the line of routine employment. If a clerk making an honest effort to do the right thing is *still* likely to get death threats, how many people will be willing to be clerks? So the corollary of my belief that we're better off if people take responsibility for their work is that if we want people to sign, we must make them feel reasonably safe in doing so. We must not only expect people to sign their work, we must respect them for doing so, and not tolerate any form of abuse toward them.

That, unfortunately, seems to require a massive shift in cultural attitudes from the ones we're now tending toward—and that leads me back to what I see as the most troubling aspect of electronic communications. They make it easier than ever to *make* threats, with minimal danger of their being traced or the sender being convicted even if they are. They make it easier to do slipshod business without clear accountability. Some companies now go far beyond form letters with house names: they publish ads listing only a company name and an e-mail address, so that potential customers (or victims) have no idea whom they're dealing with or where they're located.

Electronic communication makes it easier than ever to make statements no one would consider acceptable in face-to-face conversation. It makes it easier than ever to take stands without taking responsibility for them. Do you really want a company that you work for or do business with—or a government that you live under—to be run by people who never have to say what they really believe, and be held to it?

In a very real sense, to borrow a phrase from Shakespeare, "Anonymity doth makes cowards of us all." It has an important place in statistical processes like surveys and elections. In cases where an individual is taking actions or making statements that might have significant consequences for others, its value is far less clear. Except under clearly special circumstances, its value may be strongly negative.

A society that encourages people not to stand up and take stands is asking for trouble. A society that makes people afraid to do so is practically begging for it. As technology makes it ever easier for people to say and do things that they can never be identified with or held accountable for, we'd better give some serious thought to how we're going to protect ourselves against the dangers that ability implies. ■

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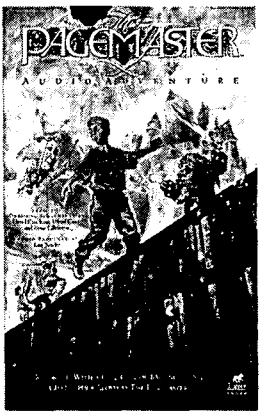

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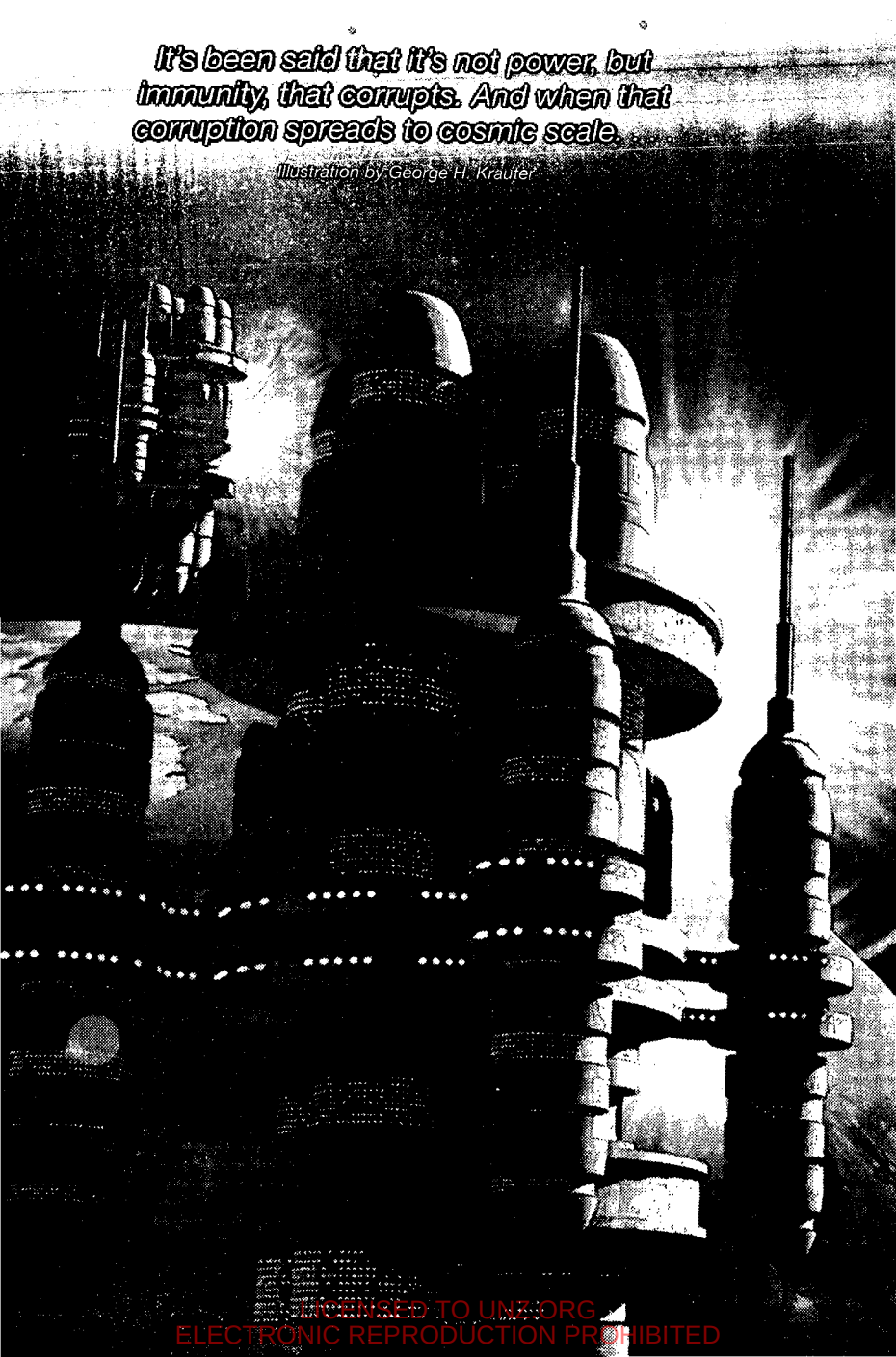
It's been said that it's not power, but immunity, that corrupts. And when that corruption spreads to cosmic scale...
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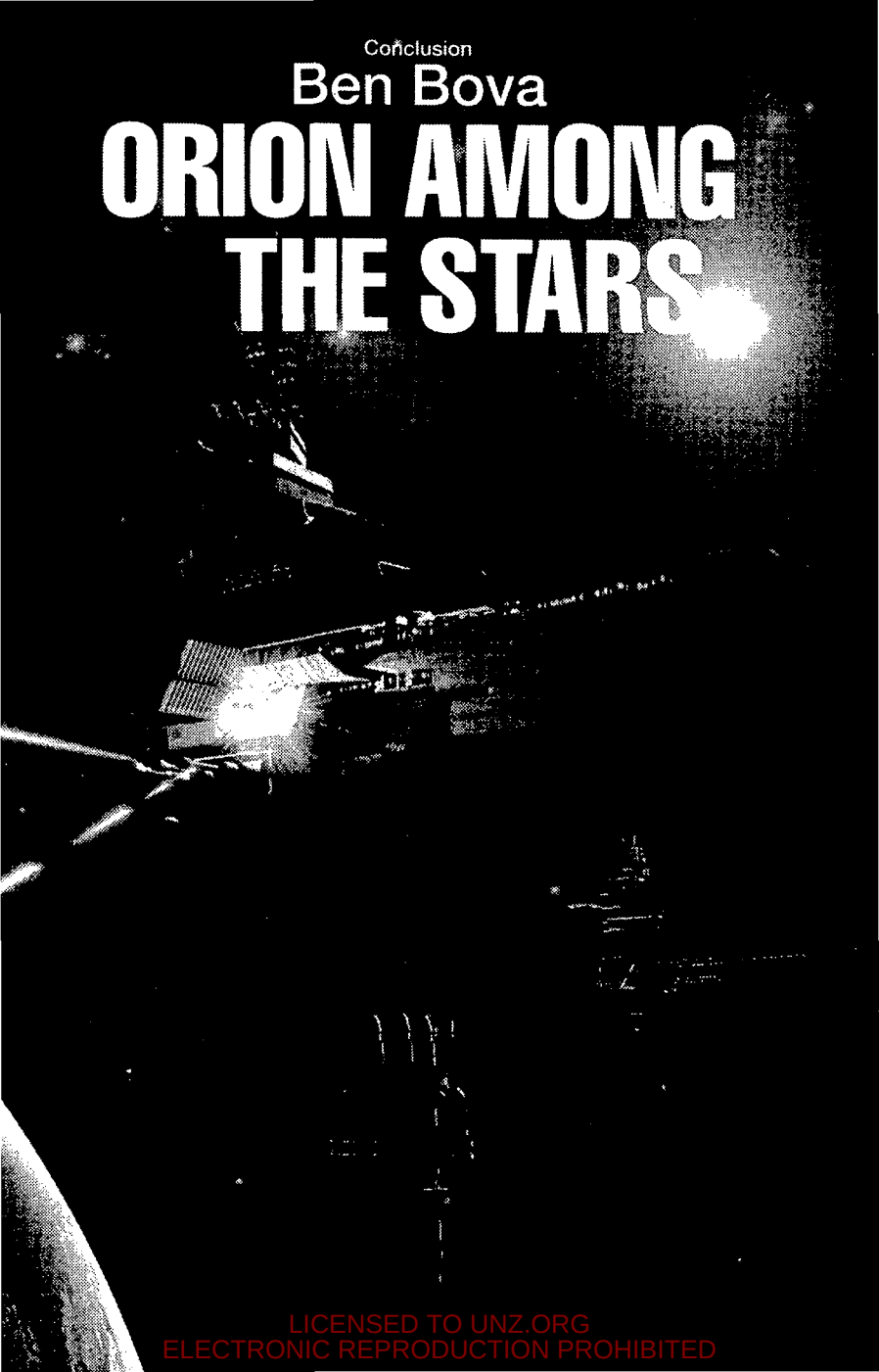
Conclusion

Ben Bova

ORION AMONG THE STARS



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SYNOPSIS

I am Orion.

I was created by Aten, the Golden One, and sent through time to do his bidding. I have fought at Troy and Jericho, I have done battle when dinosaurs ruled the Earth. I have died many times, to be revived by Aten and sent on other missions in spacetime.

Aten claims he created the human race; that he sent me and others of my kind back in time to destroy the Neanderthals and prepare the Earth for Homo sapiens, *his creatures. If he speaks the truth, then we are his ancestors. His, and the other Creators as well.*

There are many Creators. Often in ancient times they allowed themselves to be worshipped as gods and goddesses. I loathe Aten and the other Creators, even though I am bound to do as they command.

But there is one Creator whom I love: the beautiful Anya, who has helped me and protected me over the eons and light-years of spacetime. And she loves me; a goddess and a creature, in love.

Now I find myself in the midst of a vast interstellar war, in which humans are allied with a reptilian race called the Tsihn. I am captain of a combat team that has been sent on an impossible mission.

The soldiers are literally born to the army. Both men and women, they are clones who have been raised strictly for military duty. They have never known any other life but warfare. Between battles they are frozen cryonically; it's cheaper than feeding them.

My combat team has been sent to the jungle planet Lunga, which is held by troops of the Skorpis, a race of giant catlike warriors. The mission has been a disaster from its outset. Hugely outnumbered, my team was nearly wiped out by Skorpis attacks, and abandoned by the Tsihn battle fleet in orbit about the planet.

I led the survivors halfway across the planet to the main Skorpis base, on the shore of a tropical sea, intending somehow to attack the enemy. Lt. Frede, the woman who is my second-in-command and bunkmate, is having treasonous thoughts of abandoning the fight and living off the land, forgetting about the war and merely trying to survive in the jungles of Lunga.

My orders are to fight the enemy. I am Orion, the hunter, the warrior. I will fight to the death. But first I must scout out the Skorpis base. I decided to approach the base from the sea. Alone.

As I swam toward the Skorpis base I discovered why Aten sent me to the planet Lunga. Its seas are inhabited by the Old Ones, an ancient race of ocean-dwellers, far older and wiser than we humans and the youthful races that we war with. Aten wants me to make contact with the Old Ones and get them to help us win this interstellar war.

And the war is against other humans! Although there are other races involved, such as the Tsihn and the Skorpis, this vast, devastating, generations-long war is actually a struggle between the Common-

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wealth and the Hegemony, both human civilizations.

In reality, it is a war among the Creators. Just as they did at ancient Troy, the Creators are manipulating the humans and the other races in a deadly power struggle among themselves. Their war has already killed billions and destroyed entire planets.

Aten and his faction are battling against a bloc of Creators led by Anya, the goddess whom I love, the Creator who has taken on human form in one lifetime after another to help me, the woman who loves me.

But I am Aten's creature, bound to obey him. And now Anya is my enemy.

Our reward for bravery on Lunga is to be assigned an even tougher task: the assault on Bititu, a rocky asteroid that has no apparent strategic value. Bititu is defended by Arachnoid troops, man-sized spider-like warriors who fight to the death.

Again I find that the reason behind the mindless, bloody assault is to reach the Old Ones. Although the Old Ones have carefully stayed aloof from the warring humans and their various allies, they know that both Aten's Commonwealth and Anya's Hegemony are developing weapons that can destroy whole stars. That they will not permit.

The Old Ones warn me that they will destroy the entire human race, erase it from the continuum of spacetime, if either side attempts to destroy a star.

Aten and his faction of Creators refuse to believe the Old Ones's warning. I desperately try to reach Anya, to convince her of the danger, even though she is leading the enemy forces of the Hegemony.

With Frede and the other survivors of my combat team I fly a scout ship to Prime, capital planet of the Hegemony. There I find my beloved Anya. She is dying.

PART IV

CHAPTER 25

"There is one way to save you," I told Anya.

"I know what you're thinking, Orion, but it can't be done. You can't kill Aten."

"He's killing you."

She touched my cheek with her fingertips, there in the gathering darkness of twilight, then kissed me lightly on the lips. "It can't be done. He's too powerful."

I replied, "He's constantly moving through spacetime to adapt his bioweapon microbe against your attempts to destroy it. He's turning the entire continuum into a shambles in his mad lust for dominance. He's got to be stopped."

"But if we other Creators, with all our powers, can't stop him, how could you?"

"I almost killed him once, back in the time of Troy. Remember?"

"He was raving mad then."

"And you fellow Creators pulled me off him. I could have snapped his neck, but the others stopped me."

Despite her fears and her weakness, Anya smiled at me. "We may have made a mistake."

"May have? You tried to cure his madness and now he's killing you."

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"Orion," Anya said, "I know how brave you are, and how much you love me. But to attempt to kill Aten is worse madness than he himself displays. He will destroy you with the flick of a finger. Destroy you utterly, and never revive you again."

I shrugged. "So what? I don't want to live if it means serving him forever, lifetime after lifetime. I don't want to live if you die, if he kills you."

"It's hopeless, Orion. Useless."

I got to my feet, extended my arms to her and helped her up. "It's not hopeless, my darling. I have hope. That may be all I've got, but I won't give up hope until the life is crushed out of me."

Anya's gaze shifted away from me. She took in the splashing stream, the trees swaying in the evening breeze, the first stars beginning to appear in the darkening sky.

"We'd better go back," she said, with a sigh.

"Yes," I said. "We have work to do."

I closed my eyes and felt the abyssal cold of the interstices in the space-time continuum. It may have been only my imagination but it seemed to me that it took a longer span than usual to translate us back to that chamber beneath the surface of the planet Prime. Time is meaningless in-between spacetimes, but I sensed that the old pathways were coming apart, unraveling like a frayed ball of twine, the ripples of causality churning into a chaotic froth.

Once again Anya sat at the head of the long, polished conference table. I stood beside her, a spotlight of energy still glowing around me in the otherwise shadowed chamber. She was old, weary, gray and dying.

The light around me dissolved and I was free to go to her, take her in my arms. She felt frail and dust-dry, as if she could crumble at my touch.

But her eyes were still luminous, still alive and alert.

"You'll have to be my strength, Orion," she said. "I can't last much longer."

Spheres of energy appeared along the table, glowing fitfully, feebly. They resolved themselves into a half dozen of the Creators, all of them aged, withered, dying.

"The Old Ones have sent a message through Orion," Anya told them. "They will not permit either of us to use the star-killer. They say they will eliminate us all if either the Commonwealth or the Hegemony attempts to do so."

Like the Creators surrounding Aten, these Creators also scoffed at the Old Ones's threat.

"How could they eliminate us? They don't even have spacecraft. No technology at all."

"None that you can recognize," I said, still standing beside Anya's chair. "But they can control the forces of the Universe in their own way."

"It's a bluff," sputtered one of the gray-bearded men. "They're afraid that we'll attack their stars and they're trying to frighten us."

"I don't believe so," said Anya. "They are far older than we. I suspect their powers are far greater than we can imagine."

"If that's the case, then we might

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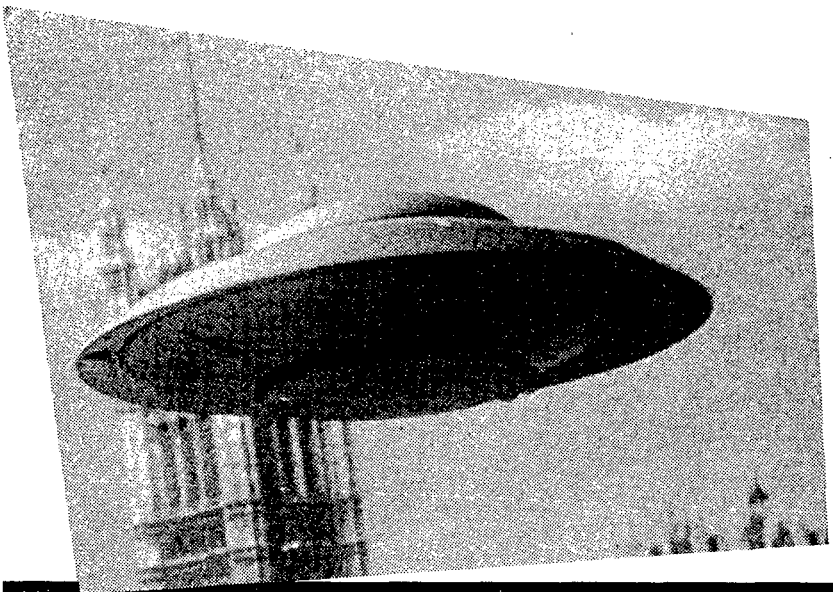

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as well surrender to Aten right here and now."

"If the Old Ones have taken away our last trump card, then we've lost the war."

"We'll have to throw ourselves on Aten's mercy."

"He'd stop the ravages of this disease of his if we simply agree to follow his leadership."

They were old. They were tired. They had considered themselves immortal once, and now the prospect of painful death had them frightened and cowed.

"I agree," Anya said to them, her voice utterly weary, infinitely sad. "There is no further point to continuing this war. Despite the fact that we hold the military advantage at present, we have lost."

"Ask Aten for a truce."

"Call him now."

Anya said, "We don't even have the strength to reach him. The disease has weakened us too much. We'll have to send an emissary to him, physically."

I was about to tell them that I could reach Aten, but something made me hold my tongue. I glanced down at Anya sitting hunched over beside me. She did not look at me, but I got the distinct impression that she had warned me not to speak.

"I will go to him," Anya was telling the others. "Orion will convey me in his ship. You can return to your hibernation fields until I return."

They nodded among themselves, then one by one became encased in those glowing spheres of energy that they used to move through space-time. The spheres shone weakly, though, as if they barely had enough power to cover the individual Creators. I knew that each of them had once been able to live in the emptiness of deep space in those spheres, drawing energy directly from the stars themselves. Now they looked as if they could barely make it to their separate chambers, deep beneath the Hegemony's capitol, buried alive in hibernation crypts where they hoped they would be safe from the Commonwealth's weaponry. They slept while their creatures fought and died for them.

"Come, Orion," said Anya, "it's time to put an end to this fighting. Take me to your ship."

So all the fighting, all the strategy and battles came down simply to this: Threaten the Creators who had caused this war, and they were willing to surrender. Or at least ask for a truce. They thought nothing of sending billions of cloned warriors into battle, causing billions of deaths among the humans and other species. But threaten them, themselves, and they were ready to give up.

I could barely conceal my contempt for them all, even Anya.

And she knew it. She made a wan smile for me and said softly, "For what it's worth, I never wanted this war."

I had no intention of surrendering to Aten, but I had to obey Anya's wishes. Or at least, appear to obey.

So I watched as Hegemony technicians slipped her inert form into a cryosleep capsule, an elaborately engraved metal sarcophagus, which we

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loaded aboard the *Apollo*. The technicians and other humans in the spaceport seemed to understand that their leaders had decided to surrender to the Commonwealth. Rumors of defeat hung heavy in the air. They were sullen, fearful, angry. But they did as they were told.

Anya's last waking thoughts warned me, *Don't let the Skorpis know that we are going to surrender. They would blow your ship out of the Galaxy if they knew.*

I wondered if the humans of Prime would try to stop us, but they were obedient and allowed us to break orbit and head out of the Zeta system.

But not for long.

We were acclerating as fast as we could, trying to achieve the safety of super-light velocity before anyone could deter us. We passed the rings of defenses that orbited Prime, then flew through the belt of battle stations that surrounded the Zeta system like a globe of bristling hedgehog spines.

Someone back on the capital planet must have passed on the rumors of our intention to surrender to the Skorpis, for as we were clearing the outermost battle stations in the belt, we were hailed by a dour-faced Skorpis admiral.

I took her message in my command chair on the bridge, wearing my best ship's uniform.

"There is ugly talk," said the admiral, her teeth showing in a barely-suppressed snarl, "that you return to the Commonwealth to discuss surrender of the Hegemony."

"This ship carries one of your leaders in cryosleep," I answered. "We are transporting her to Loris, the capital of the Commonwealth, at her command."

"To surrender?"

A diplomat would have found evasive words. A politician would have lied. I was simply a warrior. "To discuss an armistice, a truce, an end to the war," I said.

"On Commonwealth terms," the Skorpis admiral rumbled, like a lioness growling.

"On the best terms that can be obtained."

"Surrender."

"Not surrender," I insisted. "An armistice. Peace."

"Surrender," she repeated. And I realized that she meant I should surrender my ship to her.

"This vessel is on a diplomatic mission. We are carrying one of the Hegemony's highest leaders. You cannot order us—"

"Stop accelerating and prepare to be boarded by my warriors," the Skorpis admiral insisted. "Otherwise we will destroy you, your ship, and the traitoress who wants to surrender."

I knew that every moment I could keep her talking was a moment closer to the relative safety of super-light.

"On what authority do you make such an unreasonable demand?" I asked, as indignantly as I could.

Her image in my display screen disappeared, instantly replaced by a view of a dozen Skorpis battle cruisers powering toward us.

The *Apollo* rocked wildly.

"They've opened fire on us!" Emon

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yelled. He was practically at my elbow; his shout was more from sudden excitement than fear. At least, I hoped so.

"Evasive maneuvers," I said.

You can't evade laser beams, even at relativistic speed. With a dozen battle cruisers within range of us, they blazed away, catching us in a cone of fire that sizzled our defensive screen and sent all the meters on the bridge deep into the red.

It was a race to see whether they could overload our screen and penetrate it before we achieved super-light and winked out of their sector of spacetime.

"Cancel the evasive maneuvers," I said. "All available power to the main engines."

We were still shaking and rattling from the blasts of laser bolts drenching our screen. And in the static-streaked displays I could see the squadron of battle cruisers coming up on us, far faster than we were. I turned to Frede, strapped into the seat beside me.

She knew what I was going to ask before I asked it. "Computer projects complete screen collapse fourteen seconds before we achieve super-light."

"That's enough time—"

"For them to vaporize us, yes," Frede finished for me.

There had to be something we could do.

"Transfer power from the forward section of the screen to the rear. That's where we're being hit."

"But if those battle cruisers maneuver to come in on our forward section. . . ." She did not have to complete the sentence. One shot on an unscreened section of the ship would cut us in two like a hot knife going through butter.

"Do it!" I snapped.

Frede's fingers licked across her keyboard. "Computer projects we'll be in super-light twenty seconds before the screen overloads," she said. Then added, "If nobody hits us forward."

We all held our breaths. The ship rocked and shivered under the pounding of the orbital stations' guns. The battle cruisers were gaining on us steadily. Two of them spurted ahead, trying to get in front of us and attack us from that quarter.

And then we flashed into super-light. All the display screens went blank and our shaking, shuddering ordeal was over.

"We made it!" whooped Jerron, from his engineer's console.

"So far," I said.

Frede turned to me. "They know we're heading for Loris. They can plant squadrons in all the likely places where we'd come out of super-light for navigational fixes. They'll be waiting for us."

"Only if we follow the geodesic to Loris," I said. "*Now* is the time for evasive maneuvers."

It was a gamble. We had to reach Loris before the Commonwealth started using the star-killers, but we could not approach Loris on the shortest route because Skorpis battle squadrons would be lying in wait along that way. So we had to take a more roundabout route, yet not such

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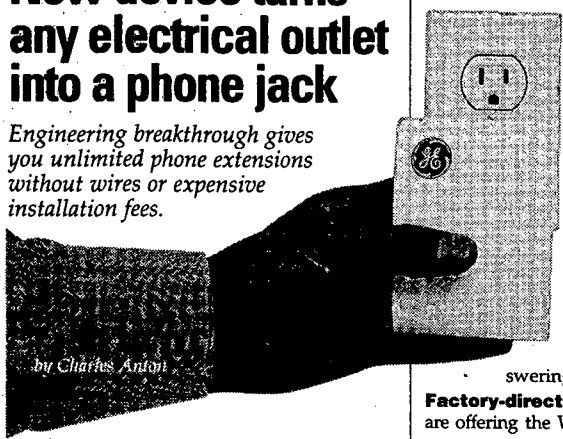

by Charles Anton

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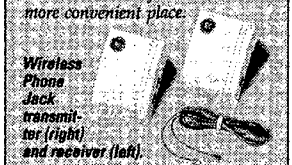

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a distorted one that our arrival at Loris would be delayed too long.

How long was too long? I had no way of knowing.

Watches changed on the bridge, time flowed by, but I remained in my command chair, unwilling to leave. I did not sleep, I ate only what the crew members brought to me from time to time. I reached out mentally to Anya's frozen body in the cryo-sleeper deep in our ship's hold. She was alive, her mind slowly flickering in the cryogenic cold.

I thought about attempting to contact Aten, but decided that the dangers there outweighed the advantages. He would read my thoughts the instant I reached him and know that although Anya and the other Creators were ready to bow to his will, I was out to murder him.

Is there some way I can shield my thoughts from him? I asked Anya for her help, but her mind was so slowed by her frozen state that I doubted she could hear me.

We remained in super-light velocity as long as we dared, then slowed to relativistic for a quick navigational fix. The course Frede had plotted for us was designed to take us a considerable distance from the direct geodesic route to Loris. But the closer we got to the Commonwealth planet, the more we would have to adhere to a course that the Skorpis could intercept.

I knew what I would do if I were the Skorpis admiral. I would send a major fleet as close to Loris as I dared, keep it in super-light except for scout ships that hop down to relativistic speed, take a look around, and then power back into super-light once more. As soon as one of the scouts spotted us approaching Loris it could alert the main fleet with a gravitational pulse that could be detected in super-light. Then the entire fleet could go relativistic and catch us as we attempted to reach the planet.

They would have to face the massive defenses of the entire Giotto system, I realized. But, as I played the possible scenarios on the ship's tactical computer, it seemed to me that the Skorpis might not only catch us like a minnow in a net, they might be able to surprise the Commonwealth defenses and overwhelm them. It was a slim chance, but knowing the Skorpis, I thought it highly likely that they would grasp at it.

I almost laughed aloud when I realized what was shaping up. Our "diplomatic" mission was going to lead to a sneak attack on the Commonwealth capital. Our effort to surrender and end the war was going to trigger the bloodiest battle of them all.

And there was nothing I could do to avert it.

CHAPTER 26

Part of me felt almost exultant. A tremendous battle loomed ahead of us, and I was created for battle. The old excitement simmered within, making my innards tremble with anticipation.

Yet another part of me was filled with revulsion. Not fear, but loathing. How many of my command had already died? And for what? How many had I killed, over the eons? I remembered assassinating Ogotai, the High

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Khan of the Mongols, my friend, my hunting companion. I remembered the slaughter once we had pierced the walls of Troy. And Jericho. I remembered Philip's accusing stare as the blood filled his mouth and gushed from the slash in his belly.

When will there be an end to blood? The Golden One boasted that he created the human race to fight for him. Could we not overcome the aggression he had built into us? Could we not learn to live in peace?

"Your sentiments do you honor, friend Orion." It was the voice of the Old Ones speaking in my mind.

I sat in the command chair on the *Apollo*'s bridge, but my eyes saw the depths of the oceans in which the Old Ones lived. And I was there among them, swimming in their midst, safe and warm in the bubble of energy they had prepared for me.

"My sentiments won't solve the problem we face," I said.

"The problem *you* face, Orion, not we."

"You are not willing to help?"

I felt a slight tremor of disappointment among them. "You must solve your own problems, my friend. Otherwise they are not solved, merely postponed."

"Yet you threaten to wipe out any species that tries to use a star-weapon."

A patient sigh. "Our ethical code demands that we leave younger species alone to work out their own destinies. But that same code cannot allow stars to be wantonly destroyed. A species willing to use such power is a danger not merely to itself, it is a danger to the entire continuum."

"Meaning that it's a danger to you."

They fluttered their many tentacles, colors spiralling across the breadths of their huge, undulating bodies.

"Yes," they admitted at last. "Such a species would be a danger to us and everything else in the continuum."

"Does your ethical code allow you to help me to prevent this catastrophe?"

A long delay, while they swam about me and flashed colors at one another.

Finally, "Orion, you are laboring under a misapprehension. You apparently believe that if you could eliminate one of your species—this one you refer to as Aten, or the Golden One—that his demise would solve your problem."

"Won't it?"

"No. We fear not."

"But—"

"Your species is very violent, Orion. It is part of your makeup. Even you, who are struggling to overcome this heritage of blood, can think of the solution to your problem only in terms of murder."

"Aten must be stopped. He is killing his fellow Creators. He seeks—"

"We know. We have seen it in your mind. But suppose you succeed in murdering Aten. Do you believe that will end your war? Hundreds of billions of humans are struggling against one another. They use weapons of constantly increasing power and horror. Will the death of one of you stop the death desires in your entire species?"

I had to think about that for a

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while. The Old Ones respected my silence.

Choosing my words carefully, I said, "The first step is to stop the fighting, to put an end to this war. That by itself will not end the violence in the human psyche, but it will stop the killing. Then perhaps we can learn how to live in peace."

"Do you think that is possible?"

"Do you see a better path?" I countered.

"No," they answered. "Quite frankly, we do not."

"Then help me to reach Loris."

"The Skorpis will be waiting for you. There is nothing we can do to protect you from them."

"Can you at least safely transport the cryosleep capsule my ship is carrying to the planet's capitol building?"

They seemed to confer among themselves again, then replied, "Orion, that is a task you must accomplish for yourself."

"You won't help even that much? In the interests of peace?"

"You must accomplish peace by yourselves, Orion," they answered. "It is your task, not ours."

I would receive no help from the Old Ones. None at all.

"Your arrival in the Giotto system will set off a massive battle," they warned.

"The last battle of the war," I said, resignedly.

"Let us hope so."

I said, "Thank you." Bitterly.

"Farewell, friend Orion," they replied. "Farewell forever."

Before I could ask what that meant, I found myself back on the bridge of the *Apollo,* with Frede staring at me oddly.

"Don't you want to eat?"

I saw that she was holding a tray of steaming food before me.

"No, thanks," I mumbled. "I'm not hungry."

How could I be hungry when I suspected the Old Ones had just bid me a final farewell because they knew I was going to be killed.

When I finally left the bridge and went to my quarters for a bit of sleep, I dreamed of ancient Byzantium, the triple-walled New Rome that stood against the barbarians hordes for a thousand years after darkness fell on western Europe.

I was a soldier, an officer, returning to the city after a long, hard campaign against the ravaging Seljuks who had swept out of the heartland of high Asia to conquer the ancient provinces of Cilicia, Cappadocia, and even Anatolia. Noble cities such as Antioch, Pergamum and Ephesus were all under the rule of the Moslems now.

My cohort had fought for months, always retreating before the remorseless horsemen from the steppes, fighting and dying as the tide of barbarism pushed us constantly back toward the Bosphorus. It saddened me to see villages, towns, whole cities put to the torch by the invaders; to know the churches and even great cathedrals were being turned into mosques by the heathen savages. Our retreat was marked by columns of black smoke, funeral pyres for our empire, that rose into the hot bright sky like accusing fingers.

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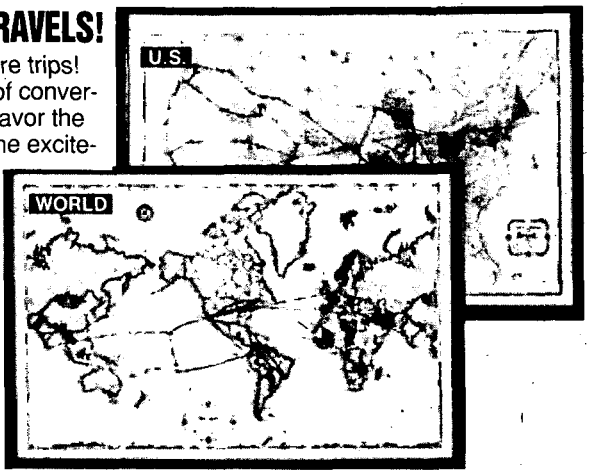

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At last we stopped them, our backs against the narrow sea that separates Asia from Europe. Not much of the old empire was saved, but mighty Byzantium stood still free—barely. The cost was thousands of good soldiers; of my cohort, hardly a full maniple remained able to stand and fight, and most of us bore many wounds. But we could tell ourselves and anyone who might listen that we had given more than we had taken. The Seljuks were just as exhausted as we, and their piles of dead rose higher than our own.

The fighting was stopped, at least for now, and I had returned to the mighty city. Weary, sick at heart, half crippled from an arrow in my thigh.

I passed through the triple gates on horseback, virtually all my worldly goods tied behind my saddle. The guards hardly paid any attention to a returning soldier; they were busy haggling with a merchant who had a long string of highly-laden mules. They wanted a good bribe for allowing the caravan to enter the city.

Through the twisting streets of the old city I rode slowly, deliberately, savoring the sights and sounds and smells of it. Vendors hawked their wares. Shopkeepers talked about the weather or the latest fashions with their customers. Men and women strolled along the thoroughfares or lolled in cafés in the city's many open squares. The aroma of roasting lamb and onions and pungent spiced wine made me almost dizzy after months of dried strips of goat or worse.

Beyond the low roofs of the houses in the market quarter I could see the beautiful curved dome of Santa Sophia. I nosed my tired mount toward the cathedral. If I should offer a prayer of thanks for my survival, why not offer it in the grandest church in Christendom?

Somewhere in the back of my mind I wondered if this was real life or a dream. Am I truly living in this era, or is this merely a dream while I sleep somewhere, somewhen else? What does it matter, I thought. I am lucky to be alive and I owe it to God and His saints to offer a prayer of thanksgiving. At last I reached the broad, cobblestoned plaza in front of the cathedral.

"You can't tie that nag here!"

The nasty, rasping voice startled me. I looked down at the hitching rail where several other horses were tethered and saw a mean, wizened, bent old man in filthy rags casting an angry, beady-eyed look at me.

"This rail is reserved for the wedding party," he croaked. "Don't you try to put that flea-bitten animal in among the quality."

I saw that the horses already at the rail were sleek and groomed and well-fed. My own poor mount showed each of its individual ribs.

"Damned soldiers think you can do whatever you want, don't you? Why aren't you out fighting the Saracens instead of trying to butt your way in where you're not wanted?"

Without a word I turned my horse and went to a farther hitching rail, tied her there, and walked back to the grizzled old sourpuss.

"I've left my life's possessions on

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that flea-bitten nag," I said to him, "except for this." And I pulled my jewel-pommelled sword halfway out of its battered old scabbard. "This blade has taken the lives of more Seljuks than you have hairs in your mangy beard, old man. If anyone so much as touches my horse or my belongings, it will take your life next."

His eyes blazed with fury, but he held his tongue. I turned and went into the cathedral. It was strangely chill inside, and dark except far up in front, by one of the side altars, where a small group had gathered for a wedding. The people whose horses the sourpuss outside was watching, I reasoned.

Kneeling on the stone floor, I could barely make out the huge mosaic of the risen Christ that filled the interior of the main dome. Dim light filtered through the high windows of stained glass, dust motes drifting through the slanting shafts. I half expected to see my own breath frosting in the air, it was so cold inside the cathedral.

Here by the main entrance, next to the massive marble baptismal font, stood a statue of Santa Sophia. I gazed at it, in the shadows, and thought the face that the sculptor had carved looked familiar. I had seen it before, on another statue, in Athens. That other statue had been the work of an ancient pagan, the statue purported to be Athena, the patron goddess of that old, decrepit city.

And here was the same face on Santa Sophia, decked in soft folds of cloth rather than armor and bronze helmet. Offering prayers for the faithful rather than holding a spear and bearing an owl on her shoulder. But the same face. She seemed to be smiling at me, a beatific smile that warmed me deep in my heart.

I did not stay long. Just one swift prayer of thanks for my life, then I limped back into the sunlight, worried that the sourpuss might take it into his head to steal some of my possessions or all of them, and disappear into the crowds of the city before I could stop him. But he was still by the rail with the wedding party's horses, and my horse still stood alone farther off. I had to admit my mount did indeed look very shabby.

The old man grumbled something at me as I passed him.

"I suppose soldiers don't tip a man who's watched their horse, do they?"

"Soldiers don't have any coins until they're paid," I said to him, over my shoulder. "And none of us have been paid since we first left the city, months ago."

"Pah!" He didn't believe my word.

I was billeted with a family that lived outside the walls. They were hardly overcome with joy to see me. I would be an extra mouth to feed, an extra horse to care for, as long as I stayed with them. They seemed to be having enough difficulty making ends meet, with five youngsters in their brood, the oldest a lad barely into his teens.

The man was a metalsmith; he eked out his living by repairing pots and copperware in the bazaar. The army would pay him a pittance for housing me, but he made it clear that my upkeep would cost him more than the government would pay.

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The youngsters clustered around me, bursting with questions about the war and the lands I had seen. They stared at my face curiously, and I realized that it was my scars that fascinated them.

Their mother had been taken by a fever that had swept the city half a year earlier. The old man had a young serving girl to cook and take care of the children. A sturdy, redheaded lass from Muscovy, from the looks of her. She was pretty, with clear white skin that had not been roughened from hard work as yet. I wondered if the old man made her sleep with him.

The two eldest boys helped me unpack my meager belongings and dumped them on one of the beds in the upstairs room, then they took my horse down the street to the stable. During the evening meal the boys wanted to hear tales of battle and victory; all I had to talk about was battles that we lost and retreats in the face of the relentless enemy. Their father ate his barley soup and black bread in dour silence, except to cast dark looks at the serving girl whenever she smiled at me.

"How many of the heathens did you kill?" asked the eldest boy.

"Too many," I said. "And not enough."

The serving girl asked me, "What is it like to take a man's life?"

I replied without thinking. "Better to take his than let him take yours."

She shook her head. "I know they're heathen Moslems and the church has condoned warring against them, but still the Christos taught us that it is wrong to kill, didn't He?"

Her disapproving frown nettled me. I wanted to tell her what the Seljuks did to Christian women when they captured them, wanted to describe the villages we had seen where the women had been raped and then put to the sword hideously, where babies had been spitted alive and used as footballs, where fire and knives were used for torturing helpless children.

But I said nothing. Because I was ashamed. My own troops had done much the same to the Moslem villages we had sacked.

"They're heathens," the old man snapped. "Servants of the anti-Christ. Killing them isn't the same as killing a Christian. The Patriarchs of the Church have told us so. They're not even human, really."

"Their blood's as red as ours," I heard myself mutter.

"Good! Spill as much of it as you can."

Leave as quickly as you can and return to the wars, he was telling me. And I resolved to do exactly that. This was not my home and never could be. As soon as my leg healed properly, I would go back to the fighting, I told myself.

After dinner, the two boys offered to share their bed with me. I laughed and told them that I had been sleeping on the ground for so long that a bed would probably keep me awake. So I unrolled my sleeping blanket and stretched out on the floor next to their bed in the upstairs room.

Just before I drifted to sleep, the older of the two boys said, "Next year I'll be old enough to join the army."

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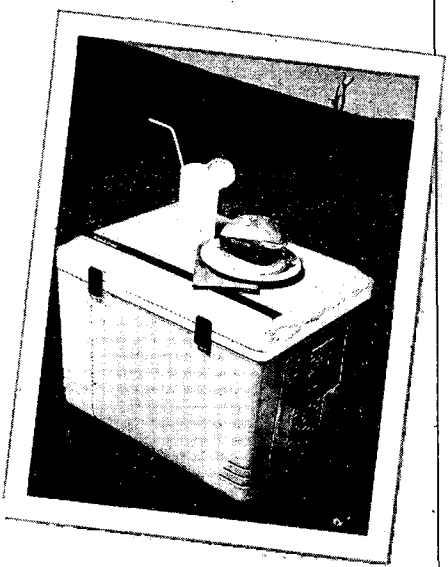

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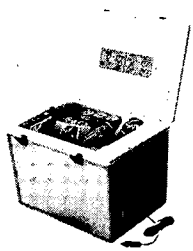

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"Don't," I said. "Stay here and help your family."

"There's no glory in staying here."

"There's no glory in war," I said. "Believe me. Nothing but pain and blood."

"But fighting the Seljuks is doing God's work!"

"Living is doing God's work, son. Killing people is the work of the devil."

"But it's all right to kill the Seljuks. The priests have blessed the war."

Yes, I thought wearily. They always do.

"The emperor himself—"

"Go to sleep," I snapped. "And forget about the army. Only a fool goes to war when he doesn't have to."

That shut him up at last. I turned on my side and went to sleep, dreaming of the distant future when ships flew among the stars.

CHAPTER 27

I awoke in my quarters aboard the *Apollo* with Frede shaking my shoulder roughly.

"You'd better look at the imagery from our last navigation check," she said, once I had opened my eyes and sat up in the bunk.

Blinking the sleep away, I pointed to the display screen set against the bulkhead. "Put it on the screen."

There had been a pair of Skorpis warships among the stars.

"Did they detect us?" I asked.

Frede shrugged. "They had to. We were only at sub-light for thirty seconds, but their sensors are as good as ours or better. They picked us up, all right."

"Did they make any move to stop us?"

"In thirty seconds?"

I studied the alphanumeric data at the bottom of the screen. The Skorpis warships had been drifting along on minimum power.

"Looks like they were waiting for us to show up," I said.

"The Hegemony must be covering as many of our potential re-entry points as possible," Frede said. "They want to know where we are and how soon we'll reach the Giotto system."

Swinging my legs off the bunk and reaching for my tunic, I asked, "How close to Loris can you put us? If we can come out of super-light well inside the system's defenses we ought to be safe enough."

"Their automated defenses will shred us within microseconds. Same as Prime and the Zeta system, remember?"

"Message capsules worked then. We could send out message capsules ahead of us, tell them we're coming in."

With a frown, Frede added, "And bringing the whole Skorpis fleet with us."

"What choice do we have?" I asked.

She leaned her back against the hatch to the bridge and did not speak for several moments. I wondered if she did not know what to reply, or if she knew so well that she was rehearsing the words she would use before speaking them.

"We could change course," she said at last. "Why do we have to go to Loris? Why put ourselves into the lion's

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mouth? There are hundreds of other planetary systems, thousands of them. The Commonwealth—"

"We've got to bring our passenger to the Commonwealth's leaders. They're on Loris. That's where we must go."

"We could go to a thousand other planets and send word to Loris," Frede countered.

"And if the Skorpis found us on one of those other planets?"

"The chances of that happening are so low—"

"But if they do, what are the chances of our surviving? Zero," I told her, before she could answer. "At Loris we have all the defenses of the Giotto system on our side. We have a fighting chance."

She looked utterly unconvinced. I could not tell Frede that my real reason for insisting on Loris was that Anya was dying. Even in cryosleep she grew weaker every day. Aten was killing her and the only way to make him stop was to confront him, to overpower him and the other Creators who had allied themselves with him. To kill him.

He would not come to a rendezvous at some out-of-the-way planet. He had made Loris his headquarters, the capital of the Commonwealth. So I had to go to Loris, I had to bring Anya there, I had to face the Golden One.

Frede's expression made me realize that I was, in all probability, about to get all of us killed.

But I pulled myself up to my full height and gave the order, "Direct geodesic to Loris. No more evasions. We bore straight in."

"And damn the torpedoes," she muttered.

"What?"

"An old naval expression. From ancient history."

With no external points of reference there was no way for our unaided human senses to get any feeling for our ship's speed. The instruments told us we were hurtling along at many multiples of the speed of light, but for all we could tell the *Apollo* was sitting still in the middle of nothingness.

Yet the morning arrived when Frede said to me, "We're within two days of the Giotto system. Time to start sending out message capsules."

I got the feeling that out there in that blank nothingness surrounding us, the entire Skorpis battle fleet was riding along with us, waiting for us to slow down to relativistic velocity once again, their weapons primed and ready to blast us into an expanding fireball of ionized atoms.

Tension on the bridge grew tighter with each passing moment. We fired off every message capsule we possessed, then used the ship's matter transceiver to make still more of them, converting some of our food stocks to do so.

"We won't need more than two days worth of food," I told the transceiver crew. "In three days' time we'll be having our meals on Loris."

"Or in hell," grumbled one of the technicians when he thought I was too far down the passageway to hear him.

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When I returned to the bridge I asked Frede, "How close to the planet can you put us?"

She looked up from her navigational screens, bleary-eyed from concentration and lack of sleep. "Fifty planetary diameters," she answered. "Half a million klicks. Right smack in the middle of their major defense belt."

"Good," I said. "Perfect."

Then she added, "If the ephemeris data in our computer's memory files is up-to-date."

"It should be," I said.

With a sardonic grin she replied, "Right. It should be." She put a slight but noticeable accent on the word *should*. "If it's not we could hang our asses on the wrong side of the planetary system. Or crash into the planet's surface."

Pleasant possibilities.

The ephemeris data was correct and Frede's navigation was practically flawless. The only factor that we did not foresee—could not have foreseen—was that the Skorpis had decided to attack Loris without waiting for us to appear.

We slowed out of super-light and into the middle of a full-scale battle. The sky was filled with warships and orbital battle stations slashing at each other with laser beams and nuclear-tipped missiles.

Apollo jounced and shuddered as a Skorpis dreadnought loomed directly before us, firing its main battery at a Commonwealth orbital station, but turning its secondary laser banks squarely upon us.

I barely had time to yell, "Battle stations!" Control of the ship automatically went to my command chair; the keyboards set into the ends of my armrests now directly controlled all the ship's systems. The rest of the bridge crew were there strictly as backup for me.

My intention was to get to the surface of Loris, but in the midst of this battle that was going to be impossible. The planet's defensive shields were up, powered by every megajoule their groundbased generators could produce.

Swiftly I took in the situation. The Skorpis attackers were not bothering with the planet. They were trying to knock out the belts of defensive stations that orbited Loris. With fanatical bravery they had come as close to the planet as we had before slowing from super-light, risking collisions and even crashes into the planetary surface in their eagerness to surprise the Commonwealth defenders.

Their tactic had worked. They had bypassed the outer rings of defenses, farther out in the Giotto system. Those massive battle stations were in fixed planetary orbits tens of millions of kilometers from Loris. They could be moved, but it would take most of the power they needed for their weapons to activate their propulsion systems and bring them into the battle. And it would take time, too much time for them to make a difference in the battle's outcome.

Most of the Commonwealth fleet was elsewhere, fighting the war on other fronts. The Skorpis had gambled virtually every ship they possessed, as I feared they would, for this

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one killing stroke at the Commonwealth's capital. Now they were fighting to knock out Loris's belts of defenses and the few ships that the planet could send up. Neutralize the Commonwealth's orbital defenses and the planet itself lay open to bombardment and invasion.

No telling how long the battle had been going on. In the display screens I saw the hulks of blasted ships drifting lifelessly, saw an orbital station riddled with holes, its spherical hull ripped open and bubbling hot metal. Fragments of shattered ships and stations swirled past us; some of them might have been the bodies of humans or Skorpis, they blew past us too fast for me to tell.

I saw a Skorpis dreadnought slugging it out with an orbital station, laser beams lancing back and forth, splashing off their defensive screens in wild coruscations of light. I slipped the *Apollo* under the giant Skorpis warship's belly, probing with our sensors for a weak section in her screen. They were putting most of their power into the forward screen, where they faced the orbital station.

I found a weak spot and fired our one and only bank of lasers at it. The screen went blank and the hull of the dreadnought began to blacken and peel back, curling like leaves in a flame. The dreadnought shuddered, then a huge explosion racked its innards and it stopped firing. The orbital station kept on blasting at it, and the dreadnought broke apart into molten chunks of metal and plastic and flesh.

We had killed it like a foot soldier slips his stiletto between the armor plates of a mounted warrior.

"Six o'clock high!" sang out one of the sensors as the ship shuddered from a direct hit. Our screen held, barely, as a deadly battle cruiser sailed past us, firing another salvo. We fired back, to no effect.

The battle lost all semblance of cohesion. It turned into a thousand separate fights between individual ships and the massive orbital stations. I saw one of the few Commonwealth warships capable of maneuver exchanging shots with two Skorpis dreadnoughts at the same time; it bloomed into a brilliant flare of radiance as it exploded. Then one of the dreadnoughts was caught in a crossfire from two orbital stations. The heavy laser beams carved up the Skorpis vessel and left it drifting helplessly. Another ship burst apart in a titanic explosion.

There were no sounds on the bridge except the beeping of sensors, the tight, quick breathing of my crew and the steady background hum of machinery. No one said a word, their eyes riveted to the display screens as ships fired, turned, exploded in the deathly silence of space.

I drove the *Apollo* through the thick of the battle, desperately trying to maneuver closer to the planet's surface, but it seemed as if every ship in the Skorpis fleet stood in my way. I knew that we were no match for dreadnoughts, neither in firepower nor defensive shielding, yet the battle was raging all around us, whether we liked it or not.

We could try to run in the other

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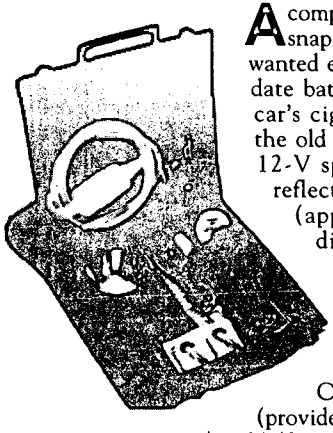

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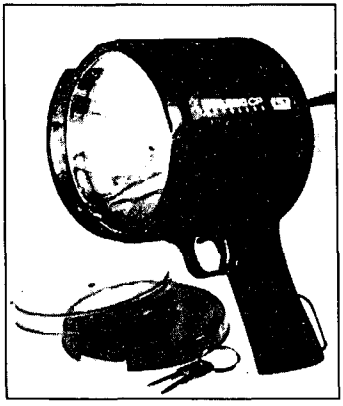

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direction, get away from the fighting and seek safety by accelerating back to super-light velocity. Then a new fear struck at me. If it appeared that the Skorpis were going to win this battle and then attack Loris itself, Aten might very well leave the planet, escape to some other point in the continuum, leaving the rest of us here. Leaving Anya weak and dying.

I had no choice. I had to stay and fight and try to help the Commonwealth win.

I dove the *Apollo* toward the nearest orbital station, a huge massive globular structure studded with sensors and weapons. Hoping that my ship's automated identification signals would keep the orbital station from frying us, I maneuvered as close to the station as I dared, taking up a minutes-long orbit around it like a bee circling its own hive.

Three Skorpis warships approached, firing as they came. Two of them were battle cruisers, the third a dreadnought. While Frede and the rest of the bridge crew watched silently, I darted our ship down below the two battle cruisers and scanned their defensive shields. Just as I had expected, they were shifting power to ward off the heavy blasts coming from the orbital station's main batteries. I located the weakest part of the first battle cruiser's shield and poured everything we had into it. The cruiser veered away, exposing its weakened belly to the orbital station. One salvo from the station's heavy guns blew the Skorpis warship to pieces.

But the second battle cruiser turned to engage us, jolting the *Apollo* with hits from its main battery. Leaving the orbital station to duel with the lone dreadnought, I raced through the swirling carnage of the battle with that determined battle cruiser on our tail, firing at us steadily. No matter how I jinked our ship back and forth that cruiser stuck to us, as if the only thing in its captain's mind was to avenge its sister ship.

Stubbornness is not an asset to a captain. I checked the display screens and saw that the battle had concentrated on one side of Loris's defensive belt. There were stations on the far side of the orbit that were not being attacked. This made good sense, from the Skorpis point of view. They were concentrating all their forces on a part of the Commonwealth's defenses, intending to overwhelm them and then destroy the remainder afterward. The orbital stations could not maneuver quickly; those on the far side of the battle could never reach the attackers in time to do any good.

But I could bring at least one of the attackers to the idling stations on the far side, if the Skorpis captain did not suddenly acquire a dose of good sense.

She did not. She followed me, closing, firing, making the bridge rattle and our defensive screens buckle. But she followed me for a few seconds too long. I zoomed the *Apollo* into range of the quiescent orbital stations and three of them opened fire on the Skorpis warship at once. It blew up in a giant fireball, the scattered fragments like blazing meteors all across the sky.

"Battle damage," reported Dyer,

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from her damage control console. "Hull open to vacuum in starboard stern. Sections fourteen and fifteen of deck two have been automatically sealed off."

"Anyone in there?"

"No sir. Those are food lockers. We emptied them out to make extra message capsules."

Frede giggled nervously. "We wanted to warn Loris that we were coming, so they wouldn't fire on us, remember?"

It seemed like a million years ago.

"Looks like they didn't need our warning," I said as I turned the ship back into the battle.

I headed for one of the orbital stations, hoping to repeat my earlier tactic of gadflying one of the attacking ships to its destruction. But as we came closer to the fighting, swirling, exploding ships I saw that six Skorpis cruisers detached themselves from the battle to aim directly at us.

"Incoming message," said Magro, the comm officer.

I tapped the comm key on my armrest board. A Skorpis commander appeared on the bridge's main screen.

"Apollo, I have orders to take your ship. You will surrender. You cannot escape us."

At the velocity we were going now it would take more than an hour to build back up to super-light. The Skorpis ships could catch us and board us long before then.

"We will not surrender," I said.

The commander bared her teeth. "My orders are to take you alive—if possible. If you will not surrender, you will die."

* * *

CHAPTER 28

Six against one were impossible odds. Especially when the six were battle cruisers, twice the size and firepower of the *Apollo.*

I looked at the stricken faces of the bridge crew. They had been prisoners of the Skorpis once before.

"They'll freeze us," muttered Emon.

"And serve us for dinner," said Jerron, trying to make a joke of it. No one laughed. They all looked grim, frightened.

"They're not going to take us alive," I told them.

"And that's the good news," Frede wisecracked. Everyone laughed, breaking the tension.

Our one chance was to make it down to the surface of Loris before the Skorpis ships could destroy us. I turned the *Apollo* in that direction, hoping that the orbiting battle stations could pick off some of the warships hounding us.

"Take power from the weapons batteries," I told Jerron. "Put every bit of power we've got into the engines."

Emon looked unhappy that his weapons were being drained. I started to say, "Keep the shields—"

The ship was rocked by several hits. Then a massive jolt slammed into us, knocking me against my seat harness painfully.

"Nuclear missile," Dyer yelled out.

I looked at her screen. The engine section had been hit.

"Screens absorbed most of the energy," Dyer reported, "but the hull's buckled. Section eighteen, deck two

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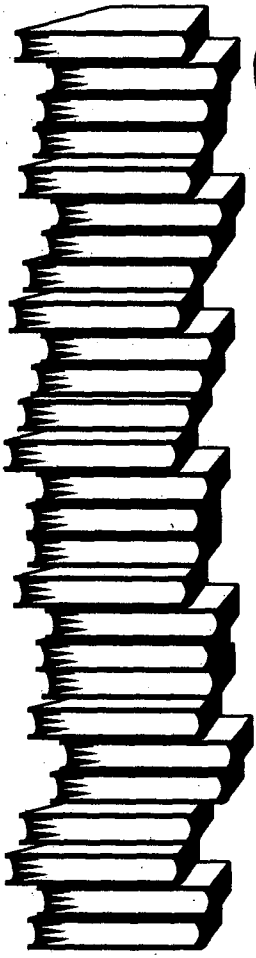

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is open to vacuum."

"Seal it," I snapped.

"Automatic," she replied.

The ship shuddered again.

"They're hitting that section," Frede said, almost calmly. "They're trying to knock out our engines."

I jinked the ship back and forth, trying to keep their laser beams from overpowering the screen shielding the engine section. But the weapons of six battle cruisers all firing at us were impossible to evade entirely. *Apollo* bounced and shook like a rat in a terrier's jaws.

One of the Skorpis cruisers blew up, victim of a Commonwealth station's guns. But the others pressed their attack even harder. One of my display screens sputtered and went dark. The overhead lights flickered fitfully.

And the surface of Loris still seemed to be a million light-years away. We were diving toward that blue and white planet, hoping desperately that the Commonwealth defenders would allow us through their planetary screen and shoot the Skorpis warships off our back.

"Power drain exceeding safety limits," Jerron said tensely. "The shield isn't going to hold up more than another fifteen seconds."

"More nuclear missiles on their way!"

I saw them in the main display screen and turned the ship to avoid them. But their guidance sensors had locked onto us.

"Hang on!"

Three explosions hit us almost simultaneously. Display screens burst in showers of sparks all across the bridge. The lights blew out. Acrid smoke filled the darkness.

The red emergency lights came on. In the dimness I saw that the bridge crew was still alive, though we would all have bad bruises from our safety harnesses.

"Power's gone," Jerron muttered. "We're dead meat."

"Not yet, we aren't," I said, unbuckling my harness. "They said they wanted to take us alive."

Frede smiled grimly. "Break out the rifles and sidearms," she said. "We'll make a fight of it."

A wild thought spun into my head. A memory of ancient days when sailing ships grappled and sent boarding parties to seize their opponents. The Skorpis were going to board us, I knew. What if we ambushed their boarding party and then seized their battle cruiser?

"Come on," I said, getting to my feet. "We don't have much time."

As we were passing out the hand weapons to the entire crew we heard the thump and clang of a Skorpis ship mating its airlock to our main hatch. With our sensors down, I could not tell if it was a shuttle craft or one of the battle cruisers.

"If that's a shuttle," I said, "there can't be more than twenty or thirty warriors on board."

"More likely it's a battle cruiser," said Frede. "They wouldn't risk a shuttle with all the shooting going on out there."

"And they know they'll need more than thirty warriors to take us down," Emon added, trying to sound cocky.

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"Good," I said. "Then after we finish the boarding party we can take over their ship."

Someone laughed in the darkness and muttered, "Yeah, the forty-nine of us against a couple hundred Skorpis."

There was no time to worry about the odds. The Skorpis would quickly burn through our locked hatch. I deployed my crew at the end of the short passageway leading from the main hatch to the power ladder that goes down to the main deck.

"Let them into the passageway, then cut them down while they've got no place to hide," I said.

I placed Emon and two other crewmen on the rungs of the ladder, where they could pop up and fire along the passageway. I flattened myself on the deck on the other side of the ladder's hatch, hugging a rifle in both arms, behind a metal table we dragged out of a crewman's quarters. Frede and the others were farther down the passageway, at the next ladderway down, ready to fire at the Skorpis boarders or duck down to the main deck and continue the fight there if the Skorpis got past our first line of defense.

We barely had time to get ourselves set. The Skorpis did not bother trying to melt the hatch's locking mechanism with a laser. They attached an explosive charge to the hatch and set it off. The blast knocked the heavy metal hatch inward, banging halfway down the passageway. Anyone standing there would have been flattened.

The Skorpis were so big that they had to squeeze through the hatch one at a time. In the dim lighting of the smoke-filled passage I saw the first one step through, a heavy rifle pointed straight ahead, helmet brushing the overhead, cat's eyes peering into the darkness warily. We could have potted him easily, but I wanted that passageway filled with as many of their boarding party as possible before we started mowing them down.

They were wearing body armor. They trudged down the passageway carefully, their boots as noiseless as cat's feet on the metal deck plates. Emon and his two crewmates kept their heads down, out of sight, waiting as they clung to the ladder's rungs. I huddled behind the overturned table, scarcely breathing.

The Skorpis warriors stood for several moments, as if waiting for something. Then I heard a muffled explosion from somewhere. And another. They were blowing in our auxiliary hatches! They must have assault teams in spacesuits breaking into the ship from all three hatches at once!

My brilliant plan was mincemeat. We had to get down onto the main deck and fight at least three boarding parties at once.

"Fire!" I screamed as I raised myself to my knees and cut the first Skorpis in half with a bolt from my rifle.

My senses went into overdrive and the world around me slowed into a dreamlike torpor. I saw Emon and his little team raise their heads leisurely above the ladder's hatch sill and squeeze the triggers of their rifles. More laser beams came sizzling over my head from Frede and her team. The Skorpis warriors, huge and clumsy in the confines of the passage-

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way, died in their tracks, slumping to their knees as laser beams burned holes through their armor, falling sluggishly, weapons dropping from their lifeless fingers. Their death screams sounded like eerie keening wails, echoing off the passageway's metal bulkheads. Their bodies even blocked the hatch, making it difficult for more of them to get in.

But they fired as they fell. They died fighting. More of them pushed through the bodies of their own dead to worm their way on their bellies toward us.

"Everybody down to the main deck," I yelled.

Too late. One of the dying warriors pulled a grenade from his equipment belt and tossed it toward the hatch. I saw it wobbling on a lazy arc toward Emon and his crewmen. I fired at it, hit it, and it exploded in a shower of white-hot shrapnel. Howls of pain came from the ladderway. A body thudded down onto the main deck.

I crawled along the deck plates, firing into the crouching Skorpis who were using their own dead as shields for themselves. I rolled head-first down into the ladder well, grabbed a rail, and let myself slide down the rest of the way to the main deck.

Emon's head and shoulders were covered with blood, his own and his crewmates'. One of the men sprawled dead on the deck, the other clutched a shredded arm with one hand.

"I'm OK," Emon said. "I can still shoot." But when he tried to stand he staggered into my arms.

I pulled him away from the ladderway and into the comparative safety of a compartment hatch. Then I went back and got the other wounded man. I saw laser beams zipping past the open ladder hatch, up above.

Sitting the wounded man against the bulkhead of the compartment, I told Emon, "The Skorpis will be pouring down that ladderway in a few moments."

"I'll hold 'em off," he said, hefting his rifle in bloodied hands.

"Do the best you can," I said. I left him there and sprinted down the passageway toward Frede and the rest of our crew.

"They blew the other hatches," I told her.

"I heard it."

"Get those people down here," I pointed to the crew who were still fighting from the top of the ladder. "We'll make our stand in the cargo bay."

"Right."

They must know that we're carrying Anya in this ship. For some reason they want her alive. They don't want her to surrender to the Commonwealth, but they'd rather take her back to Hegemony territory, if they can.

I ran past the dead and smoking bridge, ducked down the ladderway to the lower deck, and raced for the cargo hold where Anya's cryosleep capsule lay. Her sarcophagus, I thought.

Four Skorpis warriors were already prying the cargo bay hatch open when I hit the lower deck. They were in spacesuits and did not hear me run-

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ning up the passageway toward them. I gave them no chance. I fired my rifle from the hip as I ran toward them. The oxygen tanks on their life support systems exploded, blowing them to sticky shreds.

Twelve more spacesuited warriors came pounding up the passageway from the other end, where the airlock hatch was. Too many for me to handle by myself, especially when they were firing laser rifles at me. I backpedaled, then turned and ran into the nearest protective hatch. I found myself in the transceiver station, a flat open bay with a small console standing to one side.

Using the passageway hatch to shelter me, I fired at the Skorpis who stood near the cargo bay hatch. I saw one sag and slide down the bulkhead, his helmet smoking where my rifle beam had caught him. The others turned toward me. I fired twice, shattering a helmet visor and burning a hole through the arm of another Skorpis. They backed away, firing. I ducked back inside the transceiver bay hatch.

A standoff. They could not get into the cargo bay; neither could I.

I wondered if the ship was still hurtling toward Loris, and if the planet's defensive systems would blast the Skorpis battle cruiser and us with it. Or had the cruiser's captain maneuvered us away from our collision course with the planet?

Footsteps running up the passageway. I glanced out and saw Frede leading the rest of the crew. I counted only thirty.

"Look out!" I yelled. "They're at the other end of the passageway, by the cargo bay hatch."

Frede and her people flattened out against the bulkheads, firing and being fired upon as they, one by one, ducked into the transceiver bay with me.

"We caught the other boarding party coming through the after hatch," she said. "Took some casualties."

"So I see." None of them were unwounded. Frede's face was smeared with blood and sweat.

But she grinned. "We wiped them out. Killed every last one of those damned cats."

That leaves only a couple of hundred, I thought. It was obvious that the Skorpis battle cruiser had attached itself to our airlock. We were not dealing with a shuttle load of warriors, not the way they were pouring reinforcements into our ship.

"They're regrouping down the passageway," I said. "Probably getting reinforcements before they charge us."

"The first landing party, up by the main airlock—"

"They'll be coming down here the same way you came. We'll have our hands full."

"Still thinking of taking their ship?" I laughed bitterly.

Looking over the ragged remains of my crew, I saw that little Jerron was badly burned in the abdomen and left leg. He lay panting, wide-eyed with shock, with our medical officer bending over him.

"Magro," I called to the comm officer. "Can you power up the transceiver?"

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He was grimy and breathing hard, like all the others. But he gave me a nod and said, "I can try, sir."

"What are you thinking?" Frede asked.

Peering down the dimly-lit, smoky passageway, I could see no Skorpis. They were beyond the airlock hatch, preparing their next attack on us.

"They want the cryo capsule in the cargo hold," I told Frede. "Maybe we can beam it down to the planet."

"We'd have to drag it in here," Frede objected.

"We could cut through the bulkhead. Are there any flight-packs stashed in that cargo bay? That would make it easier to move the capsule."

Clearly, she did not think much of my idea. But she said, "I'll get a couple of people to cut through the bulkhead."

Nodding, I turned my attention back to the empty passageway. The Skorpis could cut through the ship's outer hull and get into the cargo bay that way, I knew. Would they try that, or would they first try to wipe us out and walk into the cargo bay after we were done with?

Why not blow a hole in the hull right here, in the transceiver bay, and kill us all at one stroke? Blow out the hull, expose us to vacuum; none of us had spacesuits. Explosive decompression—we'd be dead in an instant. The thought startled me. But then I reasoned that if they had wanted to do that they would have done it by now. A blast big enough to puncture the hull would probably damage Anya's cryosleep capsule, as well, and it seemed that they wanted Anya alive. If possible.

Waiting, wondering what would happen next, was harder than actually fighting. Behind me I heard the crackling sizzle of lasers cutting through the metal of the bulkhead separating us from the cargo bay. The passageway remained empty. Whatever the Skorpis were planning, they were taking their time about it.

I heard a crewman sing out, "Watch it, the section's falling."

Glancing over my shoulder I saw a whole section of the bulkhead, its edges glowing red, fall inward, scattering the crewmen who had burned it through. It thumped loudly, making me wonder if the Skorpis could hear it.

"Damn," I heard Frede call, her voice echoing in the nearly-empty cargo bay, "not a flight-pack in the place. We'll have to muscle it."

I called Dyer and told her to watch the passageway. Then I stepped through the jagged hole in the bulkhead to join the team of sweating, grunting, cursing men and women who were tugging at the massive cryosleep capsule.

"Heavier than a sergeant's ass," one of the men muttered.

"Heavier than your ass, anyway."

It was like dragging one of the stones for Khufu's pyramid without the aid of rollers. The capsule screeched along the metal deck plates, moving grudgingly, a millimeter at a time. I called almost all the remaining members of the crew to help us, as I watched through sweat-stung eyes while Magro bent over the transceiver console, a puzzled frown

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on his face as he pecked tentatively at the keyboard.

At last we hauled the capsule onto the transceiver stage. I felt as if I had dragged the planet Jupiter through a light-year of mud.

Trudging slowly to Magro at the console, I asked, "You do have power, don't you?"

"Yessir," he said, still frowning at the readouts. "But I don't know where we are in relation to the planet. I need a navigational fix."

I turned to Frede, who was leaning against the side of the capsule, mopping her sweaty face. "How can we—"

"Here they come!" yelped Dyer. And a grenade went off at her feet, blowing her legs off.

CHAPTER 29

I grabbed for my rifle and raced to the hatch just as a Skorpis warrior stepped through, pistol in one hand, grenade in the other. My senses were so hyper that I could see the slits of his irises moving in his eyeballs as he raised his arm to throw the grenade into our midst.

I fired and the grenade exploded in his hand, hot shrapnel streaking through the transceiver bay. I was knocked off my feet by the blast, my arm and chest were seared by bits of sharp metal. Most of my crew were already diving to the deck. Magro ducked behind the transceiver console as several shreds of shrapnel peppered its plastic stand.

The bulkhead along the passageway began to glow a dull red and I realized that the Skorpis were doing what we had done: burning their way through the bulkhead.

"Get them away from the hatch!" I bellowed, scrambling to my feet. Automatically I closed down the pain receptors and tightened the blood vessels where I had been hit.

Almost a dozen rifle beams converged on the hatch, driving the Skorpis away from it. I raced to it, dived onto my belly and skidded partway out into the passageway, firing point-blank at the armored warriors grouped around the hatch.

Someone yanked at my ankles and pulled me back into the relative safety of the bay. I kicked free and yelled, "We've got to clear the passageway of them! Otherwise they'll burn through the bulkhead and pour in here!"

We made the hatchway our bastion. Kneeling, lying prone, standing along its curved metal rim, we fired into the passageway and drove the Skorpis back. They were on both sides of the hatch, coming at us from both ends of the passage. We cut down the warriors who were trying to burn through the bulkhead and drove their cohorts back out of range of our rifles.

But they came at us again, behind a barrage of rocket grenades. There were so many that I could pick off fewer than half of them before they exploded in showers of fragments that forced us away from the hatch. I saw my crewmates fall, chests ripped open, blood spewing, faces screaming in the sudden realization of death.

We backed away and the Skorpis resumed cutting open the bulkhead. I saw it all in slow motion, firing,

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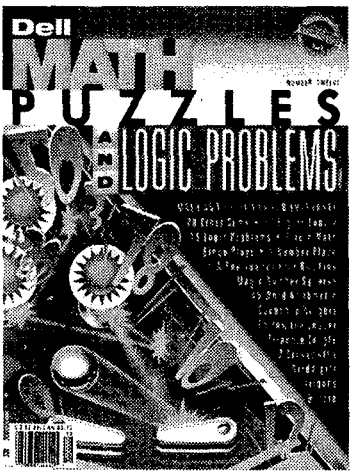

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shouting, men and women sinking to their knees, Skorpis warriors in their armored spacesuits falling as they shot at us, the bulkhead separating us from the passageway glowing cherry red under their laser torches. We retreated to the cryo capsule and hid behind it, hugging its massive flank for protection as the bulkhead finally crashed down in three separate places and scores of Skorpis warriors poured in upon us.

Their laser bolts splashed off the engraved flank of the cryo capsule, making its surface hot to touch. They were too close to us to use grenades without killing themselves, but they advanced, a centimeter at a time, past the bodies of their own dead, crawling along the deck plates to get at us.

I saw that they were trying to outflank us, get around to the sides of the chamber where we would not have the cryo capsule between ourselves and them. I fired at them until my rifle went dead, then started using my pistol.

"We've got to get out of here!" I shouted into Frede's ear.

"Good thinking," she snapped. "How?"

"Transceiver."

"Not me!" She shook her head as she sprayed a quartet of Skorpis warriors with burning laser fire.

"We're dead if we don't."

"We're dead if we do. I don't care if a copy of me lands on Loris."

But I was thinking of Anya. She knew that coming to Loris would mean throwing herself on Aten's mercy. She knew that surrendering to the Commonwealth could mean final, utter, irretrievable death for her. Yet she had come, she had insisted on this desperate gamble for peace, because she wanted to stop the war. I had thought that she—like the other Creators—cared only for their own safety. But now I realized that she also cared about the billions of humans who were enmeshed in this endless killing. She wanted to face Aten and stop the war, no matter what the cost to herself.

And I would do everything I could, anything I could, to help her.

I glanced at the control console. Magro lay at its foot in a pool of blood.

"You don't even know where the planet is anymore," Frede insisted. "You can't jump blind!"

"It's our only chance."

"Orion, don't!" Frede warned.

"We're already dead," I shouted into her ear, over the blasts of the guns and the screams of the fighting, half-crazed humans and Skorpis. "What difference does it make?"

"I'll take down as many of these damned cats as I can," Frede shouted back. "I won't take the coward's way out."

That was her training, I knew. The programming the army pumped into her brain while she was in cryosleep. Fight as long as you can. Take as many of the enemy as possible. Never surrender.

"I've got to try," I said.

She put the muzzle of her rifle under my chin. It was burning hot. "Stay and fight, Orion."

"You'd shoot me?"

"I'd shoot any coward who tried to run away."

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Out of the corner of my eye I saw that three Skorpis warriors were trying to edge across the bay and flank us again. They were dragging the bodies of fallen warriors to shield them.

"There!" I yelled, and fired at them. Frede's heavier rifle beam burned through one of the corpses and hit the warrior behind it. I hit another on the top of the helmet. The third scampered backward, back toward the protection of his mates.

And I jumped out from behind the cryo capsule, crabbing sideways to Magro's body and the slim protection of the console stand. As I raised my head high enough to look at the console instruments, I saw Frede aim her rifle at me.

Time froze. I did not blame her for wanting to kill me. As far as she was concerned, I was killing her. Matter transmission destroyed the thing being sent and assembled a copy of it elsewhere. Did it matter if the Skorpis killed us or the transceiver did? I punched the key that activated the transceiver as I stared at Frede, who locked her finger on the rifle's trigger.

But did not fire.

Everything went black. I recognized the blast of deathly cold that enveloped me. And I realized for the first time that the translations through the continuum that I had undergone were forms of matter transmission; the transceivers being used in this era were actually primitive forerunners of the capabilities that Aten and the other Creators used at their whim.

I had used them, too. Without knowing how it was done, knowing only how to direct such energies, I had translated myself across the continuum more than once.

Now, in this moment of absolute nothingness, I realized that I had to control not only my own translation through spacetime, but those of all the others, as well. And I realized something more: Every time I had died and been revived by the Golden One—it was no revival at all. He merely built new copies of me. When I died, that person died forever, as completely and finally as the lowliest earthworm dies. A new Orion was created by the Golden One to do his bidding, and given the memories that Aten thought he should have. I laughed in the soundless infinity of the void. I was not immortal at all; merely copied.

But that meant that Aten and the other Creators were no more immortal than I. They could die. They could be killed. Anya would die, unless I found a way to save her.

That way lay on the planet Loris, capital of the Commonwealth, where Aten directed the war.

I saw Loris in my mind, an Earth-like planet of blue oceans and white clouds. I reached out mentally and sensed Frede and the others of my crew. And Anya, frozen in sleep inside the cryonic capsule.

Distantly, I sensed others observing me. The Creators? Aten? No, I did not feel the snide derision of the Golden One or the haughty disdain of his fellow Creators. It was the Old Ones reaching to me. I felt the warmth of their approval, the strength of their help. This one time they were actually unbending from their aloofness to

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help me.

"Loris," I said without words, without sound or the body to speak with. Into the blank emptiness of the void between spacetimes, I gathered Anya and my crew and willed us to the planet Loris.

CHAPTER 30

Voices struck at me.

"What is it?"

"How can it be?"

"They just—appeared! Pop! Just like that."

I opened my eyes, glad that I had eyes and ears and an existence in the world again.

We were in a wide, sunny city plaza, what was left of us. Frede still leaned against the cryo capsule, pointing her rifle at me. The others of my crew were slumped against the capsule's curved flank. The side that had faced the Skorpis's guns was so hot it steamed in the afternoon air.

The plaza was filled with people. Well-dressed men and women. The buildings that lined the spacious open square were all graceful towers of glass and gleaming metal. The square was paved with colorful tiles. A fountain sprayed water barely a dozen meters from where we had landed. The people gaped at us as if we were ghosts or some strange alien apparition. More people were gathering around us, talking, pointing, staring.

We were a grimy crew. Bloody, sweaty, aching and parched from our deadly battle. Eighteen of us still alive. Our uniforms were torn, our faces streaked with dirt.

"Who are they?" an elderly woman asked.

"How dare they show themselves here?"

"I think they're *soldiers!*"

"Soldiers? You mean, from the army?"

"What are they doing here?"

"They must be soldiers of some sort. Look at the guns they're carrying."

"You're not permitted to carry weapons in the capital," a cross-faced man shouted at us. "I've summoned the police."

"They smell terrible!"

"Yes, we smell terrible and we look terrible," I shouted at them. "We've been fighting and dying to save you from being invaded."

They gasped.

"He's insane!"

"The whole group—look at them! Obvious lunatics."

"Where are the police? I called for them more than a minute ago."

I couldn't believe what I was seeing and hearing. "Don't you realize there's a battle going on in orbit above you? Don't you know you're at war?"

"It's some sort of trick."

"New theater. The younger generation always tries to shock their elders."

One of the gray-haired women stepped up to me, barely as tall as my collarbone. "See here, young man, there's no use trying to frighten us. The war is being fought a thousand light-years away from here."

I shook my head in a combination of disbelief and disgust, then turned away from her and went over to what

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was left of my crew.

Frede and the rest of the crew were just as stunned as the civilians. She lowered her rifle, slumped against the sleep capsule, and let herself slide down to a sitting position. The others sprawled, exhausted, on the brightly colored tile pavement.

"This is Loris?" Frede asked.

I nodded. "The capital of the Commonwealth."

One of the men came over and glared at me. "You can't stay here," he told me sternly. "This is a public plaza, not an army barracks."

"Where do you suggest we go?" I asked, controlling my temper.

"That's not for me to decide. But—ah! Here come the police, at last."

The crowd made a path for a pair of gleaming robots that glided on flight-packs a few centimeters above the pavement. Legless, they had six arms, cylindrical torsos, and domed heads that bore sensors and speaker grills.

"Please identify yourselves," said the one on my left.

"We are the survivors of the crew of the scout ship *Apollo,"* I said. "We escaped the battle—"

"One moment, please." The robot put out one clawed hand in a very human gesture. Then it said, "Records indicate that the *Apollo* is on a mission to the Jilbert system. Please identify yourselves."

"We never got to the Jilbert system," I said, starting to feel odd arguing with a machine. "We got involved in the battle now going on here."

"There is no battle underway here."

"In orbit." I pointed overhead.

The crowd murmured at that. I wondered if any of them would take the trouble to look at the sky after dark, when the exploding spacecraft could be seen as flashes of light among the stars.

If a robot could glare, this one did. "Please come with me."

"Where?"

"To higher authority."

Of course, I thought. Where else? Then I pointed to the cryo unit. "This capsule can't be left here. It should be brought to a hospital or—"

"The object will be taken into custody and brought to a proper facility."

"We go with it," I said.

"You will come with us," the robot replied. "The object will be taken by others to a proper facility."

I rested my hand on the butt of my pistol. Frede and my crew got slowly to their feet, unlimbering their weapons. The crowd faded back from us.

"We were assigned to guard this capsule," I lied. "We have carried it across many light-years and fought overwhelming odds to bring it here safely. We will not leave it in a public square for some garbage truck to pick up."

The robot buzzed to itself for several moments. I noticed that its partner edged off to my right slightly, as if to catch me in a crossfire if any shooting started. Little Jerron, half his tunic torn away and his skin blackened with laser burns, stepped up to it and nudged it with the muzzle of his rifle. It stopped and hovered, buzzing loudly.

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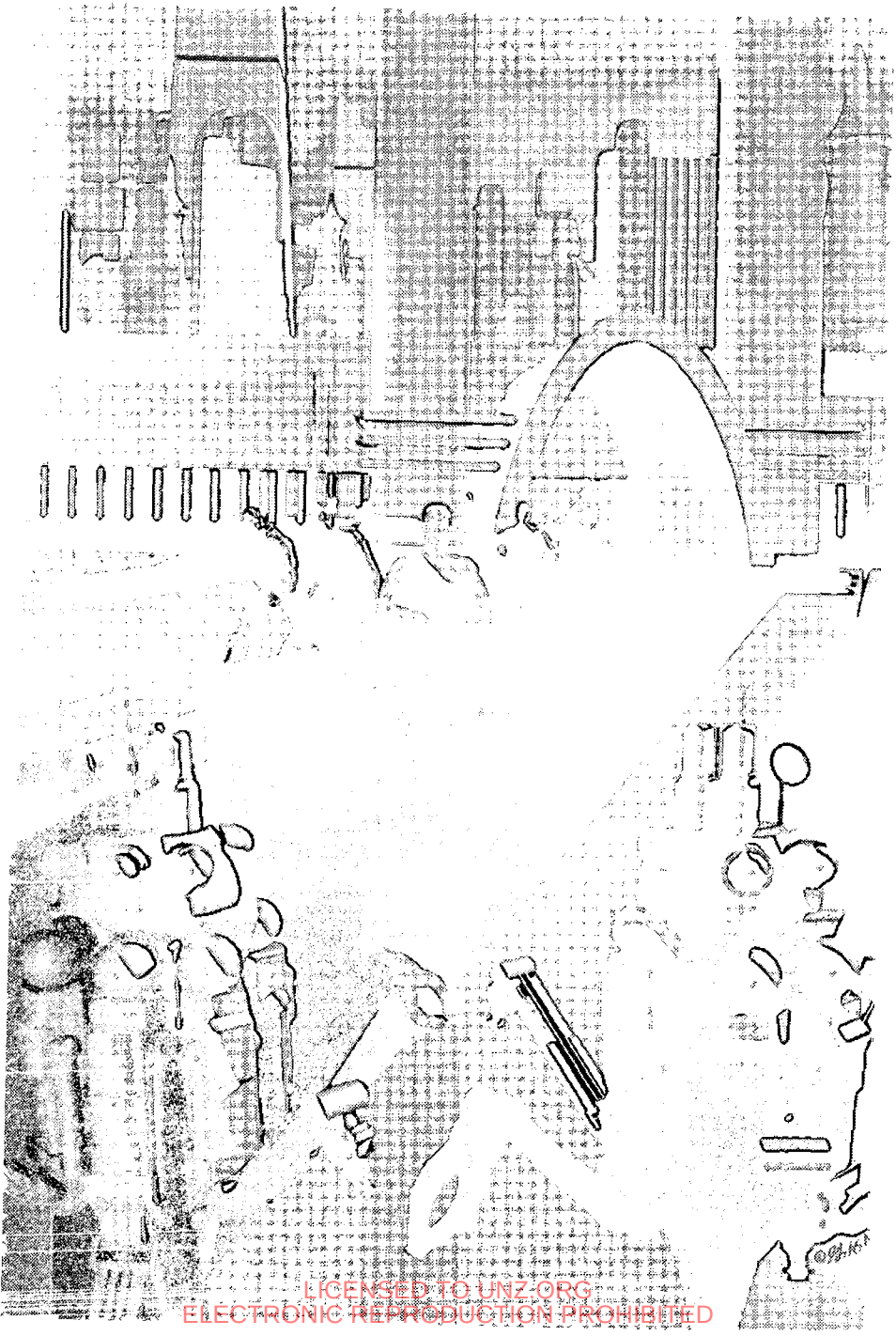

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"A trained and experienced medical team is on its way to handle the capsule," the first robot said. "It will be dealt with properly."

"Good," I replied. "We'll wait for them to arrive, then we will go with you."

Within minutes three aircars glided across the square and landed gently about fifty meters from us. The crowd muttered and chattered as a team of humans climbed out of the cars. One group wore medical whites. The others were in blue, and armed with pistols and stubby rifles.

"I am Captain Perry of the capital police," said one of the blue uniforms. He was almost my height, stocky, muscular. His curly dark hair flowed to his collar, his face was square, with a pugnacious button of a nose in its middle.

"I am Orion, captain of the *Apollo*. We've brought this cryo capsule from Prime, the Hegemony capital. It bears one of the Hegemony's top leaders, who has come here to discuss peace terms."

"While the whole Skorpis fleet is trying to obliterate our defenses?" Perry almost snarled the words.

I fell back on the time-honored refuge of the soldier. "I'm just following my orders, captain." It was a lie, but it would work—for the time being.

He tried to stare me down, and when that didn't work he said, "All right, we'll take the capsule to our medical facility. But first you'll have to give up your weapons."

I shook my head. "We're soldiers, captain. We will surrender our weapons to the proper army authorities, no one else."

"On this planet, the police have the authority to disarm anyone carrying a weapon."

"Find an army officer to order us, and we're disarmed," I said.

Clearly unhappy with us, Perry ordered the medics to attach flightpacks to Anya's capsule and slide it into their car. Then he bundled my crew into the two police cars. Eight of them went with Frede; I led the remaining nine into the car with Perry. It was a tight squeeze for us all, especially with the rifles poking ribs.

As I strapped myself in beside Capt. Perry I heard the robot police officers telling the crowd, "Please disperse. You are impeding traffic flow."

Like good little citizens, they broke up and went their separate ways, buzzing among themselves about this strange event.

All three air-cars lifted off the pavement and started down one of the narrow canyons between the glass and metal towers. We climbed above the towers and I could see the city spread out beneath me, a neat geometrical gridwork of straight streets dotted with plazas and green parks.

The white medical car peeled off and headed in a different direction.

"Wait!" I said to Capt. Perry. "We're going with the capsule."

"No, you're not," he said tightly. "The capsule's going to the med labs, where it will be examined and tested."

"But—"

"You and your crew are going to an interrogation center. We checked your story. The *Apollo* was sent to the

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Jilbert system, more than seven hundred light-years from here. Either you're lying or you're a band of traitors. Either way, we'll get the truth out of you."

I slid the pistol from my holster and nudged it under his chin.

Perry's eyes went wide. "Are you crazy?"

"Call it battle fatigue," I said. "Either we go with the capsule or your brains get splattered on the overhead."

The other police officers in the car gripped their weapons. So did my crew. The driver was the only one without a gun in his hands; he clung to the control wheel, gulped, and stared straight ahead.

"You'll kill all of us!" Perry snapped.

"That includes you."

He huffed, then said to the driver, "Follow the medic van."

We turned and went after the white aircar.

"They'll hang you by the balls for this, Orion," Perry said. "And I'll be there to cheer them on."

"After the capsule's properly taken care of," I told him, "then we can see whose balls get stretched."

The medical center was a trap.

We landed in the marked pad in the middle of four towering buildings, all three aircars touching down virtually at the same instant. As we climbed out of the cars, four full squads of Tsihn soldiery stepped out of the doors on all four sides of us, guns leveled.

"Lizards!" I heard Frede growl.

"You will drop your weapons, humans," said the Tsihn leader, a huge ocher-colored reptilian whose chest and arms were covered with insignia and decorations.

For a long silent moment we stood there confronting each other.

"I am colonel Hrass-shleessa," the big reptilian said. "I am duly authorized to command you. Put your weapons on the ground or we will fire."

I glanced sideways at Capt. Perry. He did not relish the idea of being caught in a firefight between us and the Tsihn.

We were hopelessly outnumbered. "They'll kill us all," Jerron grumbled. "Damned lizards."

"Put your guns down," I commanded my crew. "We will obey the colonel's order." I had no choice but to be an obedient soldier.

They marched us into another aircar while a medical team guided Anya's capsule, floating on its flightpacks, into one of the buildings. This aircar was army brown, and built more like a truck. We were bundled into the back, seated on the two benches running along its sides. I caught a glimpse of Capt. Perry standing next to his own aircar as they slammed the hatch shut in my face. He was grinning at me, a malicious grin of triumph.

We flew out of the city, into the mountains to its west, for more than an hour. With nothing else to do, most of my crew flaked out and drowsed. I sat on the hard bucket seat and thought of the crew members who weren't with us any more—bloodied Emon, Dyer with her legs blown

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away, so many others. Don't make friends, I told myself. A combat soldier shouldn't make any personal attachments.

We were flown to an army detention center out in the cold, gray mountains. Human prisoners and Tsihn guards. I bristled at the reptilians; every instinct in me told me they were the enemies of humankind. And here in this detention center that certainly seemed so.

They separated me from Frede and the rest of the crew, showed me to a bare little windowless cell. Nothing but a cot, sink and toilet. And a light bulb set into the concrete ceiling, too high for me to reach.

I was not in the cell for long, however. A pair of Tsihn guards unlocked my door and escorted me to a room where a junior Tsihn officer—its scales were pale lemon and bore hardly any decorations at all—sat on a high stool that was the only piece of furniture visible.

"You will sit," it said to me.

I lowered myself to the concrete floor. It felt cold, clammy. My two guards remained standing by the door.

Satisfied that he could loom over me, the Tsihn officer leaned toward me and asked, "Who are you and where are you from?"

"My name is Orion. I was captain of the *Apollo.*"

It bared its teeth. "The *Apollo* was sent to the Jilbert system."

"We never got there. We went to Prime, instead, and brought one of the Hegemony's topmost leaders here to discuss peace terms with the Commonwealth's leadership."

It snorted. I could see the humid air huffing from its nostrils. "Orion, you say your name is?"

"Yes."

"There is no record of you in the Commonwealth military files."

That surprised me only slightly. "Check with Brigadier Uxley at sector station six," I said. "He knows me. Check with my crew; we've done a lot of fighting together. Lunga, Bititu, the battle going on now in orbit."

"That battle is finished," it said grandly. "The Skorpis fleet has been driven off."

"Good."

Those red-slitted eyes stared at me. "You see, to me all you humans look alike. How can we tell if you are truly a Commonwealth soldier or a Hegemony spy? The same applies to your crew, as well."

I realized that my true story would sound ludicrously fraudulent to it. "You have brainwave scanners, don't you? You can easily see if I'm telling the truth."

"Ah, the truth," breathed my reptilian interrogator, almost like a human professor of philosophy. "What is the truth, Orion? You could tell me a tale that you believe to be true, and yet it might simply be a set of memories implanted in your mind by Hegemony intelligence operatives."

I shrugged. "Then what's the point of this questioning?"

It cocked its lizard's head to one side. "Why, to hear what you have to say. To determine if there is any valuable information in your story. That's the least we can do before we exe-

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cute you and your crew."

CHAPTER 31

So I told my Tsihn interrogator my whole story, even the truth about Aten and the other Creators. It listened with great interest, I thought, although it was impossible to read any expression on its reptilian face. But it was polite and even seemed curious, interrupting me with questions time and again.

All through my long narration, though, a part of my mind kept repeating to me that they were going to kill me. Kill Frede and Jerron and the rest of my crew. Why? Why execute loyal soldiers who had fought so hard for them?

It was my fault. I had disobeyed orders and taken them to Prime. As far as the Commonwealth was concerned, I was a traitor, and very likely a spy from the Hegemony. My crew was going to die because of me.

But then I began to think of the other factors. Somewhere in this mess was Aten, the Golden One, trying to manipulate the humans, their allies, their enemies, even the other Creators. He would kill Anya now that he had her in his possession. And I had delivered her to him.

"He'll kill you, too," I told my interrogator.

The young Tsihn blinked its yellow eyes. "What do you mean by that?"

"Aten doesn't want his creatures to know that he is manipulating them. He doesn't want the Commonwealth to know that this war is being fought because of an argument among the Creators."

The Tsihn officer was silent for a long moment. Then it said, "Either you are a very creative liar, Orion, or an absolute psychotic. Your invention of the Creators has some aspect of poetry to it, I must admit, but you carry it too far."

"He'll kill you to keep my story from leaking out," I said.

"I am not one of his creatures—if he exists at all."

"How many Tsihn have died in this war? How many more will be killed?"

"That's enough, Orion," said the reptilian. "This session is finished."

I climbed to my feet, legs tingling from sitting so long. "Your life is now in danger," I told it. Jerking a thumb toward the guards at the door, "Theirs, too."

The Tsihn remained on its stool, barely eye level with me. "Nonsense," it scoffed.

"Is it? I presume this session has been recorded, even though I don't see any equipment."

Its eyes darted to a corner of the ceiling.

"Play back the recording. See if it's intact. I'll bet it's already been erased."

"Nonsense," it said again. But it sounded just a bit weaker to me. It ordered the guards to take me back to my cell. They said not a word to me.

As the cell door slammed behind me, I knew there was only one person who could save my crew from execution. I threw myself on the bare thongs of the cot and squeezed by eyes shut in concentration. Aten was nearby; I could feel his presence, almost smell him.

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But he refused to make contact with me. As I tried, I sensed a blank wall, like an energy screen he had built around himself to keep me away from him.

Very well, then, I went elsewhere. I gathered my strength and my knowledge and tried to contact the Old Ones. I called across the light-years for their aid, their wisdom.

"Stop the war, Orion," they told me.

"How? What can I do? I can't even protect my own crew; we're all going to be executed."

"Find the strength," they said.

"Help me," I pleaded. "If you want this war to be stopped, then help me."

A vague sigh of disappointment. "It is your problem, Orion, not ours. The problem of the human race. We will not make ourselves your guardians, your conscience, your protectors. You must do it for yourselves."

"You would exterminate us," I countered.

"Only if you become a threat to stars themselves. We have no right to interfere unless you begin to threaten the life of the entire Galaxy with your violence."

And they showed me why they were concerned. I saw whole stars exploding, one after another. In a closely-packed star cluster, a chain reaction began, dozens of stars erupting into shattering cataclysm, the shock waves from each explosion triggering dozens more, hundreds more. I saw whole galaxies torn apart by titanic explosions at their cores that engulfed millions of stars, tens of millions of planets, countless living creatures. Whole civilizations, intelligent species that had struggled for millennia to reach out among the stars, wiped out in smothering waves of explosions that ripped across megaparsecs destroying everything in their path, reducing flesh and mind and hope to wildly contorted clouds of ionized gas.

"This has been done in other galaxies by intelligences very much like your own," the Old Ones told me. "This we cannot permit here. We have no desire to be your guardian angels, Orion, but we will be your angels of death if you try to destroy the stars."

I opened my eyes and found myself still in my cell, alone, abandoned by the Old Ones, shunned by the Creators, without even a rat to keep me company. Somewhere the Tsihn were interrogating Frede and the others, I knew. Somewhere an execution squad was waiting for us. I wondered if Capt. Perry would be invited to watch.

Anya. I reached out for her, to the cryonic capsule where she slept, still frozen, barely alive, her mind pulsing so slowly as the last dregs of her strength ebbed away that I could not feel even a flicker of her presence. I sensed a team of technicians probing her capsule, trying to decide whether they should attempt to revive her or just shut down the cryonic systems and let her die.

"Somebody's gone to a lot of trouble for nothing," one of the techs said. "This capsule's empty."

Empty!

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"How could it be empty?" asked the tech's supervisor. "Those soldiers brought it all the way from Prime, they said."

"Take a look. X-rays, magnetic resonance, neutrino scan—there's nobody inside this capsule. It's empty."

With a bellow of rage there in my cell I realized that the Golden One had outwitted me once again. He had removed Anya's dying body from the capsule. He had her in his possession. Perhaps she was already dead.

I leaped to my feet and roared like a jungle animal. I howled and threw myself against the heavy door of my cell. Its reinforced steel barely quivered at my pounding. I slid to the concrete floor and leaned my head against the door. Everything we had done, all the blood and killing, all the dead and wounded we had suffered—all for nothing. Aten had Anya in his grasp, and we were going to be executed, and there was no one in the whole continuum who would help me.

"Use your brain, Orion," I heard the Old Ones whisper. "Your strength does not avail you now. You must use your intelligence."

Wonderful advice. Locked in a prison cell, lost and abandoned. I butted my head softly against the door. How could I get out of here? And what should I do, if I could get out?

I could translate myself to another point in spacetime, travel across the continuum to another era, light-years away from here. But what good would that do? I had to save my crew. I had to stop the war. I had to rescue Anya, if she still lived.

I closed my eyes. Somewhere in the Galaxy, I realized, there is a matter transceiver that the Creators use for their travels across spacetime. It must be enormously powerful, compared to the transceivers we are using in this era. Powered by a star, I guessed, or perhaps even a whole cluster of stars. It extends into the continuum, flickers across spacetime so that the Creators can tap into its energies and translate themselves whenever and wherever they are. I myself have used that transceiver without even realizing that it existed. The Creators's mystical tricks are nothing more than very advanced technology, after all.

And what they can do, I told myself, I can do.

Is that so? a sneering voice in my mind challenged. The echo of Aten's arrogant disdain.

I pushed myself to my feet, there in my cell. "Yes, it is so," I said aloud, hoping that Aten could hear me, wanting him to see what I was about to do.

I felt the stupendous energy of that immense transceiver pulsating across the waves of spacetime, rippling through the continuum like a steady, strong heartbeat. I tapped into that energy, not blindly as I had before, but purposefully, knowingly.

I reached into the cells in this prison where the rest of my crew were being held. I searched across the capital city, across the entire planet of Loris and found all the members of the Commonwealth's High Council. I extended my awareness across light-years to Prime and lo-

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cated all the members of the Hegemony's Central Command.

I brought them all together, at the place and time of my choosing; the primeval forest of Paradise on Earth, at the end of the last Ice Age.

As I translated my crew there I decked them in dress uniforms of blue and gold and gave each of them a sidearm in a white leather holster. The politicians of the Commonwealth and Hegemony came as they were, some in street clothes, some in sleep wear, one in swimming trunks, another in nothing but a bath towel. Not all of them human, of course. Tsihn reptilians joined my meeting, as did Skorpis generals and several other alien species, including a clutch of Arachnoids.

I arranged a clearing in the forest with a long conference table in its middle. The politicians I placed in chairs along the table, Commonwealth on one side, Hegemony on the other. I set up a ten-meter-high web at the foot of the table for the Arachnoids to cling to. I put scratchpads on the table for the Skorpis and water sprayers for the one amphibian species.

There was a considerable uproar, of course. Humans and aliens alike yelled, screeched, thundered a thousand questions at one another. They ignored me as I stood at the head of the table in a uniform of blood red, my arms folded across my chest. My own crew seemed just as startled and confused as the rest.

I let the politicians babble and called Frede to my side.

"What is this?" she asked, breathless, her eyes wide with stunned surprise. "How did you—"

"I'll explain later," I said. "Right now I want you and the rest of the crew to serve as a guard of honor. And to make sure that none of the politicians leave the table."

Frede blinked twice, a thousand questions in her eyes. But she turned without another word and set up the crew at parade rest evenly spaced around the table, their backs to the trees and flowering foliage of Paradise.

The politicians were still jabbering and bickering among themselves, hurling accusations across the table.

I took the pistol from my red leather holster and fired a sizzling laser beam down the length of the table, burning a hole in its end just short of the Arachnoid web. They all jerked back, shocked into silence.

I smiled at them and put the pistol away as I said, "You're probably wondering why I asked you here this morning."

"Who are you?"

"Where are we?"

I held up my hands to silence them before any more questions could be asked.

"We are on Earth, at a time approximately twelve and a half millennia earlier than your own era."

"Nonsense!"

"A patent lie—no one can travel across time. Our scientists have tried it and—"

"Shut up!" I snapped in my best military voice of command.

They shut up.

"You don't have to believe a word

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I say," I told them. "That doesn't matter at all. What does matter is this: You are going to sit at this table until you have hammered out an agreement to end the war."

They stirred at that.

"I don't care if it takes days or years. No one leaves this time and place until you have agreed on peace. Once you do, you will be returned precisely to the times and places you were when I brought you here."

"And what do you propose to do if we refuse to discuss peace?" asked the biggest Tsihn there, a real dragon with multihued scales encrusted with decorations.

"I will shoot you, one at a time, until you do begin meaningful discussions."

Half of them leaped to their feet, shouting.

"How dare you?"

"You can't—you wouldn't!"

But they saw my troopers standing behind them, saw the guns at their waists, the grim smiles on their youthful-yet-aged faces.

"You will make peace or you will die," I said sternly. "Just as you send your soldiers to be killed in battle, now you can face death yourselves."

"You would kill unarmed civilians?"

"Who killed the people of Yellowflower?" I asked. "Who wiped out the Hegemony colonies? Who gave the orders?"

They sank back into their chairs.

"Listen to me," I urged them. "If the war goes on, one side or the other will begin to use star-wrecking weapons. When you come to that point, the older species of the Galaxy will annihilate all of you, without mercy and without remorse. You will all be exterminated like vermin."

That started them arguing. I assured them of the Old Ones's resolve. "Weapons powerful enough to destroy whole stars can set up chain reactions that can destroy much of the Galaxy, perhaps the entire Galaxy. That will not be permitted."

"Who are you to make such threats?"

I smiled coldly. "In a sense, I am the ambassador from the Old Ones and the other ancient species of this Galaxy. They had remained aloof from us because we are too young and too ignorant to be of interest to them. But now that we threaten the existence of the Galaxy, they have no choice but to take notice of us—and take action."

They did not want to believe me, but after long hours of debate and argument they began to accept what I told them. The Sun sank behind the lofty trees and night came on. I kept them at the table, protected and warmed by a bubble of energy. I produced food and allowed them to leave the table briefly, knowing that there was no place in this continent-wide forest that they could escape to.

"No one returns to their own time and place until a peace agreement has been reached." I said.

Days went by. They argued, they railed at each other, they hurled accusations and threats across the table. I reminded them that unless they began working toward peace I would begin shooting them. And I pointed to the loudest of the loudmouths.

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"You'll go first," I said.

His eyes widened, but he stopped his insults and imprecations.

It was like a giant group therapy session. It took time for them to air their true resentments, their real fears. They accused one another of all sorts of aggressions and atrocities, at first. But gradually, knowing that there were no alternatives, knowing that they themselves were facing death, they began to get to the underlying causes of the war.

I knew that the real cause was the manipulation of the Creators. No matter what these humans and aliens agreed upon, the Creators could upset it in the blink of an eye. I realized that after I had finished with these politicians, I would have to face the Creators. Led by Aten, the Golden One.

I was surprised that he did not show himself here, even indirectly, disguised as one of the politicians. Probably he was content to let me work out a peace agreement, and then rip it to shreds before it could be implemented. He enjoyed playing with the human race that way, toying with us, tempting us and then degrading us when we reached for greatness. Like flies to wanton boys, I thought. Except that this fly has no intention of allowing any god to pull its wings off. Not now that I've learned how to use them.

CHAPTER 32

It took weeks. Seven weeks, plus two days. A hundred times or more I thought my imposed peace conference would see a murder across the conference table. A thousand times the politicians blustered at one another, hurled accusations, threats, turned to me and blistered the air with their rage, promising to flay me alive once they got back to their own worlds.

Each time I told them that no one would leave this time and place until they had agreed upon peace, with a treaty that they all endorsed, a treaty that bound them all to stop the war. And I warned them that if they could not end the war, they would become casualties themselves.

A dozen times they came close, only to have the agreement shattered on some objection, some grievance, some seemingly impossible demand.

But slowly, grudgingly, they inched toward the agreement that I demanded. I used no force, except the threat of execution. That was enough to keep them at their work. I fed them and allowed them to refresh themselves from time to time. I allowed them to sleep when they needed to, although that caused some complications because the Skorpis preferred to sleep in the daytime and the Tsihn and humans at night. The Arachnoids did not seem to sleep at all. But always I brought them back to that conference table, like dragging a puppy to the paper it is supposed to use when you are training it.

After fifty-one days they had the agreement on paper. They were exhausted, all of them, by the effort. But where they had started, fifty-one days earlier, as enemies and strangers across the table, now they knew each other, perhaps even respected each

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other. Even the incommunicative Arachnoids had used the translating machines I gave them to make certain that their needs and desires were addressed in the treaty.

They were about to sign the document when I made the final objection.

"There is one problem that the human members of this conference have not addressed," I said from the head of the long table.

"What is that?" they demanded.

"Your armies. Your soldiers. What do you intend to do with them?"

The humans on both sides of the table glanced at one another. "Why, put them back in cryonic storage, of course. What else can we do with them?"

"Let them live," I said.

"They don't know how to live! They've been bred for soldiering and that's all they know."

"Find worlds that are not occupied and let them settle on them. You owe them that much."

"They won't know how to survive. The skills of farming and building and living peacefully have never been part of their training."

"Then train them," I said firmly. "Train them as you fly them out to these new worlds."

"They would die off in a single generation," a gruff-faced man pointed out. "They're all sterile; bred that way, you know."

"They can make children through cloning, the way you made them. And their children needn't be sterile."

"But if we sent the troops off to other planets, that would disarm us," one of the women objected. "We would have no army to protect us in case of future need."

"Let your own children train for soldiering," I said. "Defend yourselves."

"That's a ghastly idea! My children, soldiers?"

I leaned on the table with both hands. "Only when your own children are soldiers will you understand that war is not something you play at. These men and women have fought for you and you've rewarded them with *nothing*. No rights, no privileges, nothing in all their lives to look forward to except more fighting."

"But they were bred for that! They don't know anything except the army."

"They know that they want to live. They know that they want more than the prospect of pain and blood and killing. They are human beings, just as human as you are. You must accept them as such."

"It's impossible," someone muttered.

"Do you have any idea of what it would cost to settle our soldiers on new worlds?"

"Ask our own children to join the military?"

I said, "That is my demand for this peace treaty. It is not negotiable. You will release your soldiers from their slavery and allow them to lead peaceful lives."

"That is simply not possible. It can't be done."

I replied, "It will be done, or you'll spend the rest of your lives at this table."

"Now, really!"

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"You will learn, in some small way, what it's like to have nothing to look forward to. You will stay here until you realize that this form of slavery is no longer to be tolerated."

One of the Skorpis said, "If you humans are worried that you will have no one to protect you, we can be hired to serve as your army."

"The Tsihn have a long tradition of honoring military prowess," said the largest reptilian. "We could certainly make military arrangements with the Commonwealth." It turned its slitted eyes across the table. "Or with the Hegemony, once we have agreed to end the present war."

Several of the humans objected to hiring mercenaries or placing their safety in the hands of aliens on the strength of diplomatic agreements. Others shuddered at the thought of having their own children put on military uniforms.

"May I say a word or two?" Frede asked, from her station to one side of the table.

The politicians all turned to her, surprised to hear a military officer ask permission to speak. Since the earliest days of this enforced conference, they had taken their guards for granted, as much a part of the background as the trees or energy bubble that protected us from the weather.

"I know that every soldier would be very grateful for the chance to start a new life, in peace. Maybe we don't know anything except soldiering, but that includes a lot of survival skills, and we'd be happy for a chance to learn how to live normal lives. And—well, if you need us, we'd still be available."

"You would leave your new homes and fight for the Commonwealth, if we called you?"

"If it's necessary," Frede said. "You'd have to tell us why it's necessary."

"The human armies of the Hegemony undoubtedly feel the same way," I added.

It took further hours of debate. The humans asked to discuss the matter among themselves, and for the first time Commonwealth and Hegemony men and women walked off together, talking earnestly, trying to find a solution to a common problem.

The Tsihn reptilians seemed puzzled by my demand. "Why not freeze them if you don't need them?" one of the lizards asked me.

"Because they are human beings," I replied, "and entitled to all the rights that any other humans possess."

A Skorpis commander shook her feline head. "Humans don't understand the way of the warrior. They regard the warrior as an inferior person, a slave."

"Regrettable," said the Tsihn.

"That attitude is about to change," I said.

"And we are all being held hostage here until it does," the Skorpis commander replied.

"Regrettable," the Tsihn repeated. I wondered if that was its idea of humor.

Neither the Commonwealth humans nor those of the Hegemony liked it, but at last they agreed to my demand: the existing human armies would remain alive and be resettled

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on unoccupied planets.

We had peace within our grasp. But only if I could make the Creators agree to it, I knew.

I returned the politicians to their homes, precisely to the times when I had kidnapped them. Frede and the other soldiers gaped when the whole group of them disappeared, together with their conference table and everything else.

"Matter transmission," I told them.

They still shook their heads.

"I'm sending you back to Loris," I told them. Before they could object, I added, "But not to your prison cells. You'll be at the army base, in fairly luxurious quarters. If the politicians keep their word, the process of resettlement will begin soon."

"And if it doesn't?" Frede asked, with a veteran's skepticism.

"I'll come and get you," I said.

She gazed into my eyes. "Who in the name of the seven levels of hell are you, Orion?"

"A soldier, just like you."

"Dogshit you are."

I grinned at her. "I've just been around longer. I know more tricks."

"You're not coming back to Loris with us?"

"No, I've got another problem to tackle," I said.

She frowned slightly, then stepped up to me and, throwing her arms around my neck, gave me a very unmilitary kiss. "Thank you," Frede said. "Thanks for our lives."

I felt slightly flustered. The rest of the crew was grinning at us. I called them all to attention, then sent them back to Loris. They disappeared from the forest of Paradise as if they had never been there.

I took in a deep breath. The real test was facing me now. I translated myself to the city of the Creators.

This time I went right into the heart of the city, into its magnificent central square, bordered by temples from the highest human civilizations: a Sumerian ziggurat, a Mayan pyramid, the Parthenon in all of its original graceful beauty. The sun shone brightly through the shimmering golden energy dome that encased the Creators's city; I could feel the breeze from the nearby sea wafting by.

They were all there, waiting for me, all of them in perfect glowing health. All of them in splendid robes, a pantheon of human physical perfection; the men handsome and grave, the women stunning and equally solemn. All except Anya.

"Where is she?"

The Golden One stepped forward, regarded me somberly.

"Where is she?" I repeated.

"All in due time, Orion. We have other matters to discuss first."

My left hand snapped out and I seized him by the throat, pressing my thumb against his windpipe, forcing him to his knees.

"Where is Anya?" I thundered, "What have you done to her?"

The one I called Zeus, snapped at me. "Release him at once!" I saw burly Ares and several of the others advancing upon me.

I tightened my grip on Aten's throat. "Take another step and I'll snap his neck."

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"What good would that do?" Zeus asked. "We will simply revive him."

"You'll copy him," I said. "This one here will never know it. He'll be dead."

Aten's eyes bulged up at me.

"Yes, I know your tricks. I know about matter transmission and the discontinuities you've created in the continuum. I know that you regard mortal humans as less than the dirt beneath your feet."

"That's not true, Orion," said green-eyed Aphrodite. "We care for our creatures."

I flung Aten to the ground. What was the point of killing him? They would simply make another.

But a murderous anger was surging through me. "Gods, you call yourselves? Liars! Imposters! Murderers! You're nothing but a pack of ravening madmen."

"You go too far," Hera said. I remembered when she styled herself Olympias, the mother of Alexander the Great, the woman who engineered the assassination of her husband, Philip, king of Macedon.

Aten glared up at me with a fury in his eyes to match my own. "If you want to find your precious Anya," he croaked, rubbing at his throat, "you will have to settle with us first."

"What is there to settle?" I demanded. "The war is over—unless you godly murderers start it up again."

"The war is over," Hermes agreed, his gray eyes flicking to Zeus before he added, "We have settled our own differences; there's no need for further fighting among the humans."

I looked at Hermes, than at Zeus and Hera and all the others. My gaze finally returned to Aten, climbing back to his feet, glowering pure hatred at me.

"You must speak to the Old Ones for us," he said, his voice already healing from my throttling.

"Must I?"

Zeus said, "It is important that we establish friendly relations with them. Vital."

"Why?"

"The ultimate crisis, Orion!" said Hermes urgently. "It's here! There's no time to waste!"

"You can travel across time and yet you say you have no time to waste? I don't understand."

The Golden One almost put on his old smugly superior sneer, but Zeus spoke before he could. "We are facing a crisis that may be beyond our power to solve. No matter how we move across the continuum, all the time tracks, all the geodesics are being warped beyond control."

I recalled the Old Ones telling me that every passage through the continuum creates disturbances, ripples in the fabric of spacetime. Now, looking into the Creators's minds as they stood before me, I saw what they feared. They had torn that fabric with their meddling in the continuum, their egomaniacal desire to alter spacetime to suit their own desires. Now those ripples were cascading, threatening a turbulence that would rip apart the continuum itself and shatter the Universe into mangled shards of chaos. All the timestreams would be wiped out as the quantum

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fluctuations of matter/energy dissolved time itself into an endless, meaningless nothingness.

"It is worse than you know, Orion," raven-haired Istar said to me. "We are not the sole cause of the crisis."

Before her words fully registered on my mind, Zeus said, "There are others who manipulate the continuum. Their exploitations of space-time have been even more severe than our own."

"They must be stopped," Hera said.

"Before the whole continuum breaks apart," Hermes added.

I stared at them, trying to digest what they were telling me.

"It's the truth, Orion," said Aten, the Golden One, who had styled himself Apollo to the Greeks. "We are all in enormous danger; the entire Universe is threatened."

"That's why you want the Old Ones," I realized. "You need their help."

Aten nodded. "Theirs, and the help of all the elder races in the Galaxy."

"And this war that you put humankind through for three generations? Where you destroyed whole planets? And you were ready to destroy the stars themselves—what was the real purpose of it?"

Aten's golden eyes shifted away from mine momentarily, then he pulled himself to his full height and answered, "We disagreed about contacting the elder species, such as the Old Ones. I wanted to enlist their help; Anya and those of us who sided with her wanted to leave them alone."

"And for that you put the human race through a century of war? And dragged in all those alien races, as well?"

Some of the old arrogance came back into his expression. "Anya can be very stubborn."

"Where is she?"

"She refused to join us in this—" he hesitated, as if searching for a word, "—this peace conference."

"She was dying."

"I was trying to make her see things my way. It worked with the others," he gestured carelessly toward Poseidon, Aphrodite, and several of the other Creators. "But, as I said, Anya is very stubborn."

I suspected that there was more to it than he was telling me. "You say that she objected to contacting the Old Ones?"

"She thought we could face the ultimate crisis without their help."

I turned to Aphrodite. "Is that true?"

"Yes," she said. But as she spoke, her eyes were on the Golden One, not on me.

I looked at each of them in turn, finally resting my gaze on Zeus. "What's the rest of it?" I asked him. "I know there must be more to this than I've been told so far."

He stroked his neatly-trimmed beard for a moment, almost smiled at me. "Accept what Aten has told you, Orion. Help us to gain the trust of the Old Ones."

"How can I tell them to trust you when I myself can't?"

Aten's gold-flecked eyes blazed at me. "You'll never be revived again, Orion. You've outlived your use-

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fulness if you don't help us get to the Old Ones."

Staring into those angry eyes, I thought I finally understood what they had refused to tell me.

"You don't want the Old Ones's help. You want their power. You want to learn what they know so you can use it for your own ends. You talk about the ultimate crisis, but you still dream of dominating everyone and everything, you still aspire to mastering the entire continuum."

Aten smiled coldly at me. "You've learned a lot since I first created you. Perhaps too much."

"Stop this masquerade," I demanded. "Show me the truth."

His smile faded. The sky overhead darkened; clouds boiled up out of the sea and swept by. The other Creators aged and withered before my eyes: Aphrodite's hair went dead white, her face wrinkled; Poseidon turned weak and trembling like a palsied old man; even Zeus and Hermes and Hera sank into decrepit gray-skinned wrecks.

Only Aten retained his youthful vigor. He even seemed stronger than before, glowing in the storm-clouded shadows like the sun.

And the Creators's city itself crumbled before my eyes. The temples turned to dust, the columns cracked and toppled to the ground. The Earth shook. Lightning split the sky.

"You think you have learned so much, Orion!" Aten sneered at me. "How little you know, creature!"

He waved one hand and the sky cleared as quickly as it had clouded. The other Creators had collapsed into heaps of rags and shriveling, decaying flesh in the midst of the ruined city.

And I recognized the ruins.

"Lunga!" I gasped. I could see past the rubble-strewn square, past the demolished stumps of towers and temples, out to the curving beach where the Skorpis base had been.

"Not Lunga," said the Golden One. "That was a bit of a deception I played on you, Orion."

I realized what he meant. "Earth. This is Earth. It never was Lunga, it was Earth all along."

"Far in the future," he said. "So far that the Moon has wandered away in its orbit until you can't even recognize it unless I point it out to you."

"Then the Old Ones are from Earth!"

"I doubt that. Perhaps from Neptune, originally, but not Earth. Some of them colonized Earth's oceans, apparently, long eons ago."

"Who destroyed your city?"

Smirking. "We did it ourselves. Another of our little family squabbles. No difference, we can built it up again when we're ready."

"And the other Creators? You've killed them all?"

"They're not dead, Orion. I'm merely demonstrating to them—and to you—that I am the mightiest of all. They bend to my will or I take their lives from them."

"That's what you did to Anya."

His face clouded. "She escaped me. Somehow, she got away. I suspect that you were responsible for that, Orion. In another era, another place-time, you rescued her."

I felt a surge of joy at that, not merely because I saved her, but be-

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cause it angered and frustrated him.

"But I'm canceling that occurrence," the Golden One said. "I'm ending your existence, Orion. You've outlived your usefulness."

"And the Old Ones?" I taunted.

He cocked an eyebrow at me. "Ah yes, the Old Ones."

"You need them, don't you?"

"Not as much as I need to be rid of you," he said. "I created you to be my hunter, to do my bidding, but you've become more trouble than you're worth."

"You'd rather have the Universe shatter into ultimate chaos than have Anya challenge your supremacy," I said.

His smile returned. "Better to reign in hell, Orion, than serve in heaven."

Once I thought I had wanted to die, to be released from life, freed of the endless wheel of pain and disappointment. But now I wanted to live, to find Anya and revive her, to reach the Old Ones and ask their help in saving the continuum from utter collapse, to stand in the way of Aten and keep him from realizing his megalomaniacal dreams.

"Gotterdamerung," I said.

"The twilight of the gods," he replied. "The downfall of everything. I will be supreme at the end."

"Never," I said, and translated myself out of the ruins of the Creators's city, away from Earth, far into the depths of interstellar space.

It felt like a death. Yet I knew I would live again to seek Anya, to fight against the Golden One, to find my place in the continuum.

* * *

EPILOGUE

It was a brown, arid world, but not without its beauty.

I stood on the crest of a dusty hill clawed by arroyos, looking out on a desert valley. Millions of years ago this had been sea bottom, but now the nearest body of open water was a thousand kilometers away. Yet there was life here: cactus and dry brown brush, poisonous lizards and tiny darting rodents with beady eyes and long hairless tails. Birds chattered from the few scrawny trees. Insects glinted in the harsh hot sunlight.

There was a patch of green down in that valley, with a village at its edge. A tiny knot of buildings made of sun-dried mud bricks, roofed with gnarled thin branches. Men and women were in the fields nearby, bent over their crops.

At first glance I did not notice any machinery, any sign that this human settlement was more advanced than the Stone Age. But then I caught the glint of sunlight on solar collectors atop the roof of a large building. I saw a geodesic dome, a small one, but large enough to house a communication antenna.

There were no roads in sight, only footpaths out to the fields where the crops were growing.

I had nothing with me but the tatters of an old uniform and an ancient dagger that I kept strapped to my thigh. With a smile of satisfaction, I started down the eroded bare dirt of the hillside, heading for the village.

I arrived as the Sun touched the western horizon and the workers were coming back from the fields.

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They were startled to see a stranger.

"Who're you?" asked the young woman in their lead. She looked to be still in her teens—sandy hair, sky-blue eyes, a scattering of freckles across her pert nose.

"My name is Orion."

"Where're you from? How'd you get here?"

I waved a hand vaguely toward the hills. "I've come a long way. I'm glad I found your village."

She gave me a strange look, part suspicion, part curiosity.

"You said your name is Orion?"

"Does the name mean anything to you?" I asked.

She shook her head uncertainly. The others had gathered around us. I looked over their familiar faces. Clones of Frede, Magro, little Jerron. I saw that the oldest woman among them was pregnant.

"We don't get many visitors out here," Frede's daughter said to me. "Just inspectors from the Commonwealth, once every other year or so."

"What do you call this planet?" I asked them.

"It's official name is Krakon IV," said one of the teenaged boys.

"Yes, I know that. But what is your name for it?"

They glanced at each other. "We just call it Home."

I smiled at them. Home. Their faces were streaked with sweat and they looked tired from their day's work, but they seemed healthy and contented. Their clone parents had found a Home for themselves, far from the wars that they once knew.

"Well, come into the village," Frede's daughter said. "My mother and the elders will want to see you."

Healthy, contented, and not afraid of strangers. The whole village came out to see the new arrival: gray-haired adults, scampering children, young women holding babies in their arms.

Frede's eyes widened when she recognized me. She ran up and flung her arms around my neck.

"Orion!" she cried. "Orion!"

She could still embarrass me. Gently I untangled from her embrace, while the entire village watched, grinning.

"Why are you here?" she asked, suddenly wary. Her eyes were still bright and alert, although the hair had streaks of gray in it.

"I wanted to know how you're doing, nothing more."

She sighed with relief. They feasted me that night. I saw that the primitive look of the village was deliberate. They had decided to live with their environment as much as possible. Electricity from sunlight, engineered microbes to fix nitrogen for their crops and drive away insect pests, a self-contained nuclear pump to bring up water for irrigation.

"Maybe one day we'll build ourselves an aircar or two," Frede said as we sat at table in their main hall. "But for now, we can walk wherever we need to go."

"You seem contented."

She pointed to a young woman with a baby in her lap. "That infant's my granddaughter, Orion. Our second generation can bear children naturally."

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Jerron had died, she told me, of a heart attack. "Magro's our medic now. He's got up-to-date equipment, but Jerron's heart just quit. Nothing anyone could do. We buried him out in the fields. He was our first death."

After dinner, Frede and I took a slow walk beneath the bright stars of their night sky.

"You mean you came all this way, to this lonely little frontier world, just to see us?"

"Why else?"

"I thought for a moment," she confessed, "that you'd come to recruit us as soldiers again."

"You're getting a bit old for that," I said.

"Our children aren't."

"There's no need for soldiers. The peace between the Commonwealth and the Hegemony has held for almost twenty years now."

"And you haven't aged a bit."

"I age much more slowly than you."

She was silent for a while as we walked out to the edge of their cultivated fields.

"You're on your way to find her, aren't you? The woman you love."

I nodded in the moonless dark. "Yes. I've got to find her, no matter how long it takes."

"Do you need help? Is that why you've come?"

"No, no. You can't help me. I've got to do this alone."

"Can't you stay here with us? With me?"

I looked down at her starlit face and saw that she was totally serious.

"I wish I could," I said as tenderly as I could manage. "But I've got to find her. Wherever she is in time and space, I've got to go to her."

Frede shook her head sadly. "You've done so much for us, Orion. Can't we do anything for you?"

I smiled. "Live in peace, Frede."

For me, I knew, there would be no peace. Anya was out there somewhere among the stars and I had to find her before all the timestreams of the Universe unraveled and collapsed into a chaos that would shatter the continuum forever.

I was no longer Aten's creature, bound to do his bidding through all the ages of the continuum. I am my own man now, I told myself. But I am still Orion, the Hunter. And my hunt is just beginning. ■

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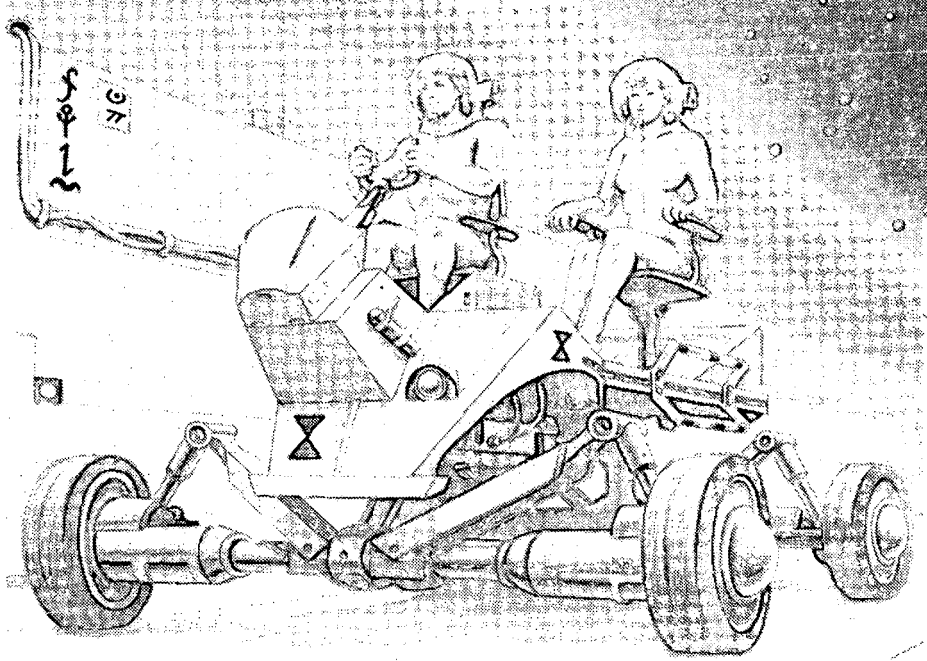
Pauline Ashwell

HUNTED HEAD

When looking for a job, it's a good idea to stay open to out-of-the-ordinary possibilities. . . .

Illustration by Jonathan and Lisa Hunt



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Sandy had known for weeks that it was probably coming, so the feeling of sickness that struck her on reading the formal notice that her grant was not to be renewed was unexpected. It was also *unfair*. She was working on the situation; taking steps. There were still a couple of foundations which had not so far sent a form letter regretting that this year's cash was all committed. And there were several laboratories with the kind of facilities she needed, to which she had not yet had time to apply. She was a damn good technician and had the references to prove it; she was willing to take minimal wages if she could have a couple of yards of bench space and access to a steriliser. It was a bargain for any lab with microorganisms to be looked after. She'd make them see that, if she could just get an interview. . . .

So this was *not* a catastrophe. Just one more rotten thing in a day that had started with a split fingernail, followed by the sight—no, *spectacle* of Danny in the cafeteria, sitting between a blonde and a brunette, with a redhead opposite; all three no doubt hanging on his every slurp (anyone who expected *words* before he had drunk at least two cups of coffee would be out of luck, so early in the day).

One of them at least was said to be rather bright. . . . Well, they were all pretty, they'd have learned their way around; whatever happened would be purely recreational on both sides. It took a Plain Brain who'd never dated anybody but nerds to—

Why the hell had she let him get away with it? Well, Danny wasn't stupid—not where his own interests were seriously involved. He had got at her through a weak point. she hadn't seen the need to guard: professional pride. To be humbly consulted by The Hunk about his problems in getting mutant *Rhabditis* to breed, because everybody knew she was a whizz at culturing micro-critters, was irresistible.

Come to that, why should she have resisted, at that point? Fellow scientists *ought* to help one another, within reason. That was where she slipped up. It was reasonable to list things he should check on—pH of the nutrient gel, possible contaminants. But she shouldn't on any account have offered to make up a new batch, even if she could do it about ten times as fast as he could. And most emphatically, when he started beefing about the difficulty of using a micro-pipette, she should have shown him how to use it *once*, and then stood by and criticised; not taken pity on the clumsy lunk and picked out the necessary number of males and unfertilised females from the wriggling mass of transparent worms herself. That had not only cost hours she didn't have to spare, it had set a really bad precedent. . . .

And, of course, once he had a sufficient biomass of the hybrids to do the fashionable part of the work, the DNA analysis, he'd dumped her.

She should have followed the advice of the chairman of her dissertation committee; concentrated on raising bacteria-free cultures of just two species of protozoa and com-

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pared their DNA. Even with the present squeeze on postgraduate grants, projects involving DNA were mostly getting by. Instead, she'd allowed herself to get fascinated by the astonishing variety of things that could be achieved within a single cell, and gone all out to cultivate as many as she could. She had successfully raised fifty-three species of ciliates in bacteria-free media during the first year, and had planned to spend the second relating the differences to success or otherwise in various environments. What, for instance, was the evolutionary advantage of being *unable* to synthesise an essential component of nucleotides?

Interesting, the chairman had said; but grants committees these days were not impressed by natural history. But that was what she was good at; getting micros to live and reproduce under conditions that were wholly unnatural for them. She had thought she was proving the chairman wrong when her proposal was accepted. Then had come a 10 percent cut in the cash available for postgraduate studies. . . .

But if only the old fuddy-duddy had had the strength of mind to *insist* that she followed his advice—

No, she was not going to start thinking like that. She had always insisted on doing things *her* way, ever since she got out of the orphanage, so any troubles she had were nobody's fault but her own.

But now she had been reminded of another bit of lousiness to come; a meeting with her chairman. No doubt he would express his regrets and refrain, very obviously, from pointing out that he had told her so. Give him his due, he might be a has-been who had published only hackwork since he got tenure, but he was always ready to listen. Not like some. . . .

Better take another look in her pigeonhole, though; had she ever had a session with him that hadn't been canceled at least once? But this time there were no message slips with her name, in the pigeonhole marked J. No excuse for not getting it over with—

"Miss Jennings?"

Sandy's heart gave a jolt. She spun round and stared up—and up—

Of course it wasn't *him,* how could it be? This man was bigger, and stronger looking, and so much more threatening—

"I beg your pardon," he said. "I startled you."

"Yea, I—It doesn't matter. I have to go."

She slid sideways with her back to the pigeonholes, to avoid going past him, and hurried away. She was headed in the wrong direction, and going round three sides of the campus meant she was going to be late, and this was all bloody stupid. It was not even as though he was a stranger—just that fellow who turned up sometimes at seminars and so on, supposed to be doing research on the literature. But she'd never heard him speak before; he had the same faint accent, and it brought it all back—

If the chairman noticed that she was sweating and out of breath he was too polite to comment, and his expression of regret was mercifully

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short. Sandy was getting set to leave when it appeared that he had something else to say.

"Er . . . Miss Jennings, Dr. Marius was enquiring about you."

"Who?"

"*Ma-ri-us*. You haven't met him? He spends a certain amount of time on campus, mostly in the library. A tall man—"

"Hey! Built like a bruiser and drésses like a banker? Dark hair—?"

"Um. Yes. Yes, I should say that described him rather neatly. . . . He . . . er . . . well, he has a number of contacts in the University administration, and the recent cuts in postgraduate funding are not precisely secret—"

"He knows I'm getting the push," said Sandy impatiently. How many other people knew, she wondered. Had Danny heard yet?

"That is not exactly—well, I suppose, from your point of view—The fact is, Miss Jennings, that Marius has—er—been instrumental in obtaining posts for several postgraduate students who, for one reason and another, have had their studies disrupted, and it seems—er—"

"He hands out research grants?" Hell, she thought, and I acted as though—

"No, not exactly. He has connections with some firm or other that carries out a certain amount of research —on pharmaceuticals, I believe."

Sandy said, "Oh."

Pharmaceuticals research meant tests on animals—rats, mice, rabbits, even monkeys. No, thanks.

"I could be wrong about that. It might be worth your while to see if he can help you at all."

It might, of course. Pharmaceutical labs were likely to have the sort of equipment she needed—

Firmly, Sandy shook her head.

"Ah." Surprisingly, he seemed rather relieved. "Well, I thought I should—er—mention it, you know. Under the circumstances."

"What's wrong with him?"

"Wrong? With Marius? Well, nothing—that I know of. . . ."

Sandy looked at him, and waited.

"As I said, he has helped several of our students who were in difficulties. For instance, Elizabeth Wong."

Sandy knew that story all right. Elizabeth Wong had been the star student in biology, about five years back. Orphaned, no money, existing on scholarships and holiday jobs—like Sandy herself. She had been working for her doctorate—on DNA, what else? and had been promised a post at some other university as soon as her doctorate came through. Then she had made the mistake of describing her work too thoroughly to a visiting professor from the department concerned.

The need for outside work held up the writing of her thesis. She was still working on it when a paper was published, more or less duplicating her results. The author was a former student of the professor in whom she had unwisely confided. . . .

She might still have got her doctorate—there was no doubt that she had done the work. However, without waiting to find out, Elizabeth Wong had left the University, and nobody

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knew where she had gone.

Except, apparently, Sandy's chairman—and Marius, of course.

"Don't misunderstand me," said the chairman hurriedly. "I—well, a couple of years later, finding myself in that area, I went to visit her. . . ." He sighed. "I don't think I was altogether welcome, though she was perfectly polite—no doubt the visit reminded her of things she preferred to forget. But she appeared to be . . . um . . . settled, happily enough."

"So what's wrong?" enquired Sandy bluntly.

"Nothing, of course. Except that . . . well, Elizabeth has never published anything. Of course, pharmaceutical work . . . trade secrets. . . ." His voice trailed off.

"How about the others?"

"They were not in this department. I believe, though, that they were all people with no family or close friends. I'm told letters have been received from them, occasionally . . . but again, no published work. It seems . . . well, a waste. . . . But it would do no harm to hear what he has to say."

It would harm my nerves, anyway. Sandy thought as she walked away. Hearing Marius was exactly what she did not want to do, ever again. It probably was not his fault that he sounded exactly like the man who had visited her in nightmares, regularly, for years—still did, once in a while. . . .

She had worked out, many years later, that it must have happened when she was four years old. She and Mom and Da had all been together downstairs, though it was long after her bedtime . . . and Mom kept asking Da whether he had locked the door. Da said he had, but all the same the big man got in and took him away. . . .

That was all she remembered. Some time after that she and Mom were in what in retrospect must have been a Greyhound bus, and she got tired and went to sleep. . . . It must have been after the end of the journey that she got left at the orphanage, though who took her there she could not remember; anyway she never saw Mom again, or Da either.

No way to find out, when she got old enough to try, whether the big man was a member of the Mafia or a plainclothes cop. . . . The horror of the dream had been pretty well worn out by the time she got to high school. She had forgotten how the big man sounded until she heard that accent again. . . .

Well, whoever she might have been born, she was now Sandy Jennings, B.Sc and halfway to Ph.D. What mattered now was getting the other half. The big problem was to keep her cultures alive and uncontaminated until she could afford another year's research. Keeping herself alive was less of a problem; she had been working part-time for a small firm which supplied cultures of various organisms for teaching and research, and they would be glad to take her on full-time. She could have had bench-space there, but there were no facilities for sterile working.

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Sandy found that she had somehow gravitated to her cubicle in the lab. There was nothing she needed to do there—none of the cultures would need fresh medium for another three days. No point in starting any of her planned experiments; she would have to clear out before any of them were complete—

"Miss Jennings? I wonder—"

The voice—

Sandy gave a yell of fright, whirled, and in the same movement backed away. She came up against the wall of the cubicle—and it gave way like so much tissue paper, so that she fell backwards through it and went sprawling on the floor.

On *a* floor. The lab floor was of bare hardwood. This felt . . . padded. And the ceiling was far too close. And it shone. And what she could see of the walls—

"Are you hurt?"

That voice again. Sandy shuddered. Then, because lying on her back felt vulnerable and undignified, she sat up . . . and stared.

Marius was standing a few feet away. Directly behind him was a solid, unbroken wall. Not only that, it was plastered with high-tech stuff—switches, dials, digital readouts and other items so way-out she had no idea what they could be.

"Are you hurt, Miss Jennings?" Marius kept his hands rather ostentatiously at his sides. "I would offer a hand, but since I appear to alarm you—"

"I'm all *right,*" Sandy said, and scrambled to her feet.

* * *

She was standing inside a twelve-foot cube. No furniture; but the walls to the left and right were loaded, like the one behind, with switches, indicators, matte black oblongs that could be some kind of VDU. The style of even the simplest items was somehow unfamiliar. The opposite wall had a door in the middle—slightly recessed, as though it slid rather than swung. On one side was another door, narrower; on the other a tier of smaller panels—locker doors?

The floor looked like marble, despite its softness. The ceiling, devoid of light fittings, diffused a soft glow.

One thing was certain; this didn't belong on the other side of her cubicle wall. Or in any other part of the laboratory.

She said, "What the hell is this place?"

Marius sighed.

"That is not easy to explain. I had intended to talk to you before bringing you here, but—"

"*Bringing* me? What for? How?"

"For convenience I had virtual interfaces set up at a number of points. One was in the wall of your cubicle. Again for convenience, the activator is built into this ring." He lifted his hand. Turned towards his palm was a flat black stone. "When you . . . er . . . fell back against the partition I put out my hand automatically, and apparently touched the sensor-point." Regretfully, Marius shook his head. "An unlikely accident; finding the point takes several seconds, as a rule. The interface opened and you fell through."

"Interface with what, for-

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godssake?"

"This universe. . . ."

Presently Sandy realised that her mouth was hanging open. With an effort she pulled it shut. *Universe?* The place was weird, all right—but it was a human sort of weirdness, not—not—

Marius was speaking again.

"Miss Jennings, we can go on forever like this. You ask a question, I answer, you do not know what to believe. Since you are here, I suggest two possibilities. Either you come with me and I show you something of this place, which will answer many questions in a way that leaves no room for doubt; or I will re-activate the interface for you to return."

"You mean—you'd let me go? Just like that?"

"Of course. Go, if you wish; and I will never trouble you again."

Sandy opened her mouth to ask another question; then realised that she knew the answer. Telling people would be like claiming to have been carried off in a flying saucer. Marius knew he was safe on that score. . . .

She said, "Right. Open it."

Marius turned to the wall behind him—the one through which she had fallen, now a solid mass of gadgetry—made a few adjustments, and depressed a switch.

Part of the wall was replaced by an oblong of grey nothingness, high and wide enough for a man to go through.

Marius stepped aside. Sandy approached and peered at the greyness. This was uninformative. She extended her hand and poked it cautiously. No sensation resulted, but the end of her finger disappeared.

Summoning all her nerve, she leaned forward and pushed her face into the nothingness. This time she felt the faintest possible resistance; then she was looking into the laboratory.

How shabby the place was—stains; chips; corners picked out with indurated grime. . . . Footsteps sounded from beyond the partition. She drew back hurriedly.

In front of her, the mass of gadgetry reappeared.

"The interface was set for one passage only," Marius observed. "Now you have used it you will not be able to go through unless I activate it again. I will do so if you wish it."

That, Sandy thought, was not an offer; it was a threat.

If there was one thing she hated, it was being manipulated. . . . Moreover, she was damned sure the switching on of the "interface" through which she had fallen had been no accident. He had just seen a chance to get her here without a lot of discussion, and jumped at it.

On the other hand if she walked out now she would *never* know what this was all about, and the itch of unsatisfied curiosity would be worse than letting him get away with it. . . .

Just how stupid a risk would she be taking, if she stayed? Or, to put it another way, what did Marius want from her?

Between her ninth and twelfth years, Sandy had been fostered by a family whose eldest son was addicted

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to fantasy. During most meals he read steadily the second-hand paperback of the moment; but once in a while he would recite the plot of the latest one, instead. Like the rest of the family Sandy tended to tune out after a minute or two, but she had grasped that the protagonist of about half these epics got lured/seduced/kidnapped/accidentally transported into some other universe, where his/her task was to save civilisation/locate some talisman/rescue, restore or replace the local ruler; on account of special skills/experience/bloodlines/availability.

None of these seemed to fit. However it was a good bet that Marius did want her to *do* something here. The alternative, that she had been chosen as a victim of unspeakable rites or a guinea-pig in unspeakable experiments, didn't make sense. She might not have any family, but that didn't mean she could be whisked away and no questions asked. Plenty of people would be looking for her in the next few days, to collect her lab and locker keys and check the inventory of equipment issued to her and get her signature on various documents and asked if she had any textbooks to sell. The chairman knew Marius had been looking for her, and already mistrusted him. Elizabeth Wong apparently hadn't suffered at his hands, unless failure to publish meant suffering. . . .

"Don't bother," she said.

Nothing showed on Marius's face, but he gave a tiny nod, as though some calculation had been proved correct.

"Outside this room, we shall wear isolation suits." He pressed a button beside the narrower of the doors. It opened and an arm slid out, two one-piece garments hung limply from it. They were made of what looked like plastic, opaque and white except for a transparent part at the top. There was a long slit down the middle of each of them; the thickened edges curled back in a way Sandy found unpleasant.

"They can be worn over clothes," Marius murmured, "but they are more comfortable without." He took down the smaller of the suits and gave it to Sandy; then he pressed another button and a screen whirred out of the wall, cutting the space in two.

Sandy examined it suspiciously. It seemed to be quite opaque, but suppose it was transparent from the other side, so that Marius could watch her undressing—?

On the other hand, why should he bother? She dragged off her sweater and jeans; hesitated for a moment about her underclothes, then removed those also.

She climbed into the suit with a certain amount of reluctance, but it felt much better than it looked, like silk rather than polythene. The transparent part at the top was stiffened and stayed away from her face; there was a thickened inset just opposite her mouth, which appeared to be a microphone—she whispered and felt it vibrate.

"The central opening will close if you smooth it together," said Marius from the other side of the screen.

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Sandy stroked the edges of the slit together and wondered, a moment later, how she was going to breathe.

"The fabric is permeable to air molecules," Marius mentioned. "Also to sweat. Are you—ready?"

"I'm decent, if that's what you mean."

"Good." The screen slid away into the wall.

Marius looked bigger than ever. Sandy's suit hung around her in baggy folds, but his, apart from some kind of built-in athletic protector, fitted him like skin.

"Excuse me," he said, and laid his hands on her shoulders. The fabric of her suit shrank inwards and settled gently against her flesh. Involuntarily Sandy sucked in her stomach and wished she had kept her bra on.

"The suit will adapt itself to give support, if you stroke it in the appropriate places." Tactfully, Marius turned his back and fiddled with things on one of the high-tech walls. Sandy experimented and found that it was true. Where did you get stuff like this? J. C. Penney's didn't stock it, that was certain. She had a hunch Bonwit Teller's didn't, either—or Nieman Marcus, come to that.

"Are you ready?" said Marius. Sandy nodded. He pressed something, and the door in the opposite wall slid aside. She looked.

Sandy realized she had been thinking of the room they had left as though it belonged somewhere inside the University. No way could *this* place have been fitted in. . . . She was standing on the edge of a central space, from which broad hallways—or highways, except that they had ceilings—stretched in four directions, more or less forever. Or on second thoughts, *one* pair went on until perspective narrowed them to vanishing point; the other pair were only about ten times the length of the campus, and ended blindly.

All four were flanked by a series of bays; from the nearest of these (and no doubt from the others, but she couldn't see that far) passages and doors opened off, indicating other spaces beyond.

The floor had a funny feel to it. Trying to identify it, Sandy shifted from one foot to the other. Nothing she could define—

Marius had come through while she was not looking. Damn. She had meant to watch. . . . She turned to him, or on him.

"Where the hell are we now?"

Marius said firmly, "You will understand more easily when you have seen more of it."

He held out a small gadget. It clicked. A moment later a spidery vehicle with two seats perched among its four wheels rolled out of a nearby bay and came to a halt in front of them. Marius handed her into a seat and heaved himself into the one beside her.

His manner reminded Sandy of somebody. After a minute or so she chased down the memory; first day at college, she and a dozen others had been shown round by an administrative assistant who obviously knew every possible question and intended to deal with them in the order and the way that long experience had shown

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to be most rapidly understood. But she was not a fresher any longer; she had been a stranger in enough different surroundings not to be bemused even here.

She said abruptly, "This is the future. Isn't it?"

Marius pressed something on his gadget and the car began to roll down one of the longer hallways.

"No, Miss Jennings. This is here and now."

"Damn it, you know what I mean. What's the *date?*"

"Look there."

He pointed to a sign glowing blue on the wall of the bay they were passing. Sandy remembered seeing something of the sort in the bays they had passed. It read, *HOUR 10.23 DAY 73, YEAR 147.*

"And before you ask," continued Marius softly, "I cannot give you a terrestrial equivalent. We are no longer in that universe—the one that contains Earth, and the Milky Way, and nebulae and pulsars and all the rest of it. The dimensions here are completely independent of the ones you know."

He had said before, "*This* Universe." Sandy had not forgotten; she just had not assimilated what it implied.

"But . . . the gravity's just the same —Oh. This is an alternate Earth—"

"No, this universe is not an alternative. It is artificial. We are inside an asteroid known as Donander; roughly a cylinder a couple of miles long. The gravity is artificial also. You may have felt a kind of disorientation for a minute or two. That is because the gravity is generated from a flat surface some distance below us, rather than being directed towards the centre of a sphere."

"*Artificial?* But—"

"Donander was separated off from the Main Continuum—from the Universe with which you are familiar—a hundred and forty-seven years and seventy-three days ago.

"How—"

"The technology used was developed some centuries after I was born. How it works, I have not the slightest idea. All the inhabitants have been recruited from Earth, from between 1900 and 2800 A.D. Now stop asking questions, and come and see."

The wheeled spider had turned suddenly at a right angle and rolled through a bay, then along a broad passage; halting finally in front of a formidably constructed, formidably fastened door. This bore a large notice in red characters and a language Sandy did not recognise.

Marius got down and approached the door. He took off his ring and pressed the black stone into a small cavity at the side of the door, which slid ponderously but quietly aside.

He withdrew the ring when there was space for one person to go through, and the door stopped moving. He beckoned Sandy to follow. Once through the door, he pressed a lever and it closed behind them.

More high-tech stuff on the walls—the place they had started from paled by comparison, if only because this was a much larger room.

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There was another door, heavy but smaller, in the far wall, and a padded bench beside it. Marius waved Sandy toward this and became engrossed in manipulating various controls, stopping frequently to consult one of the digital displays.

Finally satisfied, he beckoned Sandy up and opened the far door. Behind it was yet another grey blank. She went through it this time without hesitation and found herself in a glass-walled structure, rather like the viewing gallery in a wild-fowl sanctuary she had visited once. It looked out on a somewhat similar view, wet and marshy, with open water in the middle and trees on the far side.

Marius sat her down by one of the windows and pressed a pair of binoculars into her hand.

"The far side of the bayou. Over by that tall tree with the scaly trunk—next to the fallen log. No, the *large* fallen log, not that branch!—Now to the left of it. You see?"

Sandy had never been much of a bird-watcher. It took her some time to adjust the glasses to the width of her eyes, and longer to get them focused on the right spot. At least, she supposed it was the right spot. There was a fair-sized boulder there, basically brown in colour but greened over with what looked like algal slime. A triangular slab at the far end extended on to the bank, and . . . that must be what she was to look for . . . something like an outsize dragonfly, blundering from one clump of reeds to another—

The triangular slab moved. Slowly it reared up at an angle to the rest of the boulder. The dragonfly, which seemed not to be very well in control of itself, wavered towards it and disappeared beneath the overhang.

The slab dropped. Somewhere towards the mid-line Sandy caught, momentarily, the glint of an eye.

The paleontology course had been compulsory. She had taken it without much enthusiasm, but some of the more bizarre fossils had made an impression on her; such as a vast, flat, triangular skull with eye-sockets close together in the middle. . . . She regained her breath, which seemed to have got mislaid, and yelled "It's a labyrinthodont!"

"Certainly."

"But, but—they were on *Earth!*"

"From the Late Devonian until the end of the Triassic, I believe."

"But you said we weren't in the same Universe as Earth!"

"When I said it, that was the case. We have just passed through an interface between Donander and a Carboniferous swamp. Donander maintains a contact with the main continuum—Earth's Universe, that is—via the time-point at which it was twisted out, and this enables interfaces to be set up between the two. Once again, I have no idea why, or how; but as you have seen, it works."

"Then, then—" Sandy was just catching up with the implications, "that's what this place is for? You're studying prehistoric life—?"

"No. Or rather, we are, but not for its own sake. Come along, I want to show you something else."

This involved a journey to another

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room, at first sight identical to the one they had just quitted, where once again Sandy sat and watched Marius fiddling with controls. This time, however, what he wanted finally appeared in the middle of the room. It was a three-dimensional projection of some sort, far more solid-looking than any hologram Sandy had ever seen; although the great door was dimly visible at the top of it, behind the sky. The lower part consisted of wet black rocks under assault by an angry sea. Pools lay in the hollows, and the air was full of spray. Sandy ducked automatically, then realised that the waves were frozen in mid-surge and the spray hung unmoving in the air.

Marius did something else and the brightness of the ceiling receded to a thin line around the edge. The projection filled the room without competition. There was nothing to indicate its scale, except the apparent height of the waves in comparison with their evident force; on this basis, it was probably about half life-size.

"Do you see the meter?" Marius inquired.

It stood on the rocks at the front of the projection; if it had been as solid as it looked Sandy could have leaned forward and touched it. A squat pillar, with an oblong display in its upper part that read;

N_2 79%
CO_2 20%
O_2 trace.

Marius let her look for thirty seconds. Then the projection darkened. The shape of the rocks did not alter, but the white edge of the waves was farther away. Above, the sky was full of stars, in unfamiliar patterns. There were also two small crescents, one only a curving line, the other fatter and brighter, on opposite sides of the sky.

Marius heard her gasp.

"Good," he said. "You have seen them." He returned to the controls.

Presently it was daylight. The tide was out. The outline of the rocks had changed somewhat and the pools were placed differently. One, towards the edge was covered with a thick green scum.

The meter was still there. This time it read:

N_2 79%
CO_2 19%
O_2 1.4%

Sandy drew a deep breath and tried to keep her voice steady.

"That's another planet," she said. "Not Earth. Not in the Solar System. You're terraforming it."

"Exactly right," said Marius gravely.

"How long did it take? I mean, how long between the first picture and the second one?"

"About—" Marius glanced at the control board "—fifteen thousand years. . . . But progress is exponential; after another thousand years the oxygen content is up to 4 percent, and there are lichens on rocks inland. Do you want to see?"

"Doesn't sound very dramatic. How about the stage after that?"

"Ah. Well. The next stage was to try to establish the growth of mosses. Unfortunately it was not a success. At present the botanists are collecting

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fresh stocks with which to try again."

Sandy scratched her neck thoughtfully. "Yes, but can't they take a look and *see* which species are going to take hold?"

"No!"

It was almost a shout. Sandy looked up, startled.

"I beg your pardon." That was hardly more than a mutter. "It is the strictest rule: we never, under any circumstances, try to examine the results of a step before the work is complete."

"I would have thought—"

"No. What you see on the other side of the interface is not probability or possibility, but fact. Suppose, *before* the moss was put in place, we had turned the viewer on to the areas in which it was to be planted, a thousand years after that was to be done. Suppose, then, we saw that the rocks everywhere were still bare. Would we go ahead and plant it? Where would be the point?

"But then, how could there be moss growing, if it had never been planted? Knowledge, absolute and definite knowledge of the future as it affects yourself, is never any use. Whether it is bad or good, you cannot do anything that will change it. It simply takes away your power to decide. . . . The moss was planted, and a thousand years later it had not spread, but vanished. Therefore, next time, the thing must be done differently—other species of moss, other areas for the trial, the ground prepared in different ways. And we will check it sooner.

"Of course, when it was being planted, it was checked often—at the beginning, every day. Some of the patches appeared to take well, and to spread. After five years it was judged time to jump ahead and see whether things were ripe for the next phase. Now, naturally, there are people trying to pinpoint the time when the moss disappeared, and when they find it they will be able to investigate the reasons—cautiously, in case they should kill it all off by some mistake of their own."

"Wow," said Sandy. "Complicated."

"It is the power to go from one time to another without traversing all the times between that makes terraforming a feasible project; but it has its own dangers, and our rules are designed to avoid them."

"Yes, but—Look, how long is it since you've known that the moss failed?"

"It was discovered four days ago."

"Oh. I see."

"On that world we have unlimited time, but *in Donander* there is none to waste. In ten days at the most we should know what went wrong, and can think about replanting."

"Yea, but you said this place had been going a hundred and forty-seven *years*. How come the terraforming's only got to stage three, or is it four?"

"It took the best part of a hundred years to locate planets fit for terraforming, and to establish interfaces. That is not easy outside the Solar System. The planet you were viewing orbits a star a hundred and thirteen light-years from Sol—when contact was established, that is. The shortest distance we had to reach was thirty-

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four light-years—"

"There's more than one planet being terraformed, then?"

"At present there are five of them. That one was the most advanced. Three had a very deep corrosive atmosphere, like Venus, and time had to be spent on blowing part of it away. The other was found quite recently. None of them has got beyond the second stage."

Sandy sat back on the bench, aware suddenly of delayed shock. Reaching out over light-years, blowing away the atmosphere of planets, jumping forwards a thousand years to see how an experiment was getting on.... A chill ran up her backbone. The bench she was sitting on, the floor underfoot seemed solid enough, but—She took a fold of skin on the back of her left hand between her fingernails and bore down. It hurt.

Looking up, she caught Marius watching her with a faint smile. It vanished at once.

"It is all quite real, Miss Jennings. Difficult to believe, I know. Everybody finds that."

"Yea, but what sort of people *do* this kind of thing? Are they...." Sandy waved her hands in desperation. Were they gods? Ridiculous. Immortals? Disembodied intelligences, like the whatsisnames in that book she read once?

"They are scientists, like you. Very human. Argumentative. Touchy. In a hurry. All the time tearing their hair over the things that have gone wrong. Or the other kind, the patient ones, who do not talk about their problems, and sometimes spend all their lives looking for a way through a cul-de-sac, and sometimes stand up one day and talk quietly of what they have done, and set off a great new wave of understanding—"

"Yes, but where are they? I haven't seen a soul except you."

This time Marius did not tell her to come and see. He simply bustled her into her seat and caused the spider-car to swivel round and barrel back along the way that they had come. Sandy wondered whether she had insulted him somehow. Very soon, however, the car was going at such a speed that she was afraid to distract him by asking questions. For the first time it was making a noise—a faint whine, like a distant mosquito—and, looking down, she had the disquieting impression that the spinning wheels were not actually touching the ground.... They shot into the crossroads from which the journey had started, and she wondered whether she had failed some test or other and was about to be returned ignominiously to her own Universe. However the car twiddled through a right-angle, in a way that would surely have made any ordinary vehicle turn over, shot past a couple of bays, and halted in one with no passages opening from it, only a single door.

It was a door high enough for giants, and wide enough for ten very fat men to walk abreast. There were two main valves, each divided into a series of hinged panels, and as Marius led her towards it the two innermost panels slid away, leaving room for the two of them to go through it side

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by side.

Sandy hadn't expected it; but maybe she should have done. Once again Marius had preferred demonstration to answering. *This* was where the scientists were . . . about five hundred of them, anyway, at a quick guess; in pairs and larger groups, sitting around small tables in an enormous room and drinking coffee together. Or, judging by the variety of different cups in sight, and the various urns and other containers on the serving tables, any other beverage they chose. She could smell peppermint, and something vegetative that might be maté, but the overriding aroma was that of coffee. Good coffee.

"Sit there." Marius indicated a table for two, unoccupied. "I will fetch coffee."

He set off towards the far end of the room. There were filter cups and an urn on a counter. Oh. How did you drink through the mask of an isolation suit?

Answer to one problem; why Marius had driven so fast. The gathering was breaking up, group after group removing their cups to a counter and departing. Another five minutes and the room might have been empty.

Sandy tried to get some idea of what the nearest groups were discussing, but apart from the occasional technical term they all appeared to be using a language that she could not even identify.

One group consisted of about a dozen people, so mixed in age, race, sex, and styles of clothing that a statistician might have selected them to represent adult humanity. They were discussing something with great animation, young and old interrupting each other freely.

One man drew her eyes by his quietness. He was also notable for a bald head, crossed by a few wisps of hair, and by an expression of serene and gentle detachment. He spoke only once while she was watching, quite briefly; nobody interrupted him. A minute or so later he stood up, whereat everybody else followed suit and they all left together, the doors dilating to let them through.

"Marius!"

Sandy looked round. Marius was threading his way between tables, carrying something in each hand. He was intercepted by a thickset, untidy looking man who rose hurriedly from a nearby table, glanced round and began speaking rapidly. This time she recognised and understood the language; German.

"That the latest recruit? Look, Marius, I'm spending three-quarters of my time on the sort of work that could be done by a half-trained junior, it's a ridiculous waste. Can't you arrange for her to be assigned to me—"

"Carl, you know that I have no power of that sort."

"You headhunters can do just about anything if you choose—everybody knows that!"

"What everybody knows is usually wrong. Carl, for the simple jobs there are many kinds of automaton, and if you need help in programming them it is available—"

"Damn it, I don't want a bloody robot, I want somebody who can listen

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and then do as they're told!"

Someone at the table he had left called out to him. The man called Carl bellowed a reply, shook his head in a frustrated way, and stumbled back.

Marius reached the table and handed one of his burdens to Sandy. It was a plastic globe about the size of a tennis ball, with a three-inch spout projecting from it

"Coffee," he said. "Be careful. It's hot." He sat down and inserted the spout of his own globe into a small disc directly below the microphone of his mask.

Sandy copied him. The container had been only faintly warm to the touch, but he was right; the contents were as hot as she could drink. She sipped thoughtfully, then withdrew the spout.

"What was all that about assigning me to him?"

Marius sighed.

"You speak German? Oh, of course. One of your fosterers—"

"Uh-huh." Well, of course he would have checked her out; he could have got that much from one of several computers, along with her arrival at the orphanage and the various events that had kept her shuttling from one foster-family to the next. . . . She took another sip of coffee.

"Carl," said Marius judiciously, "is an example of a man who is very clever at his own work and quite stupid over everything else. He remembered to check that there were no German-speakers within earshot; but, knowing that I am at present recruiting from an English-speaking area, it did not occur to him that you might speak German also. And so you are offended, and perhaps alarmed. It is a pity."

Sandy glared at him. "For you, maybe. How about for me?"

That infinitesimal nod again; it was the reaction he expected. "For you, the danger of possibly acting on a false impression. Carl does not want to get it into his head, but here we have no hierarchy of senior and junior scientists, no underclass of technicians who can be assigned to take orders from him."

"Then how the hell do you decide who does what?"

Marius took another swallow from his coffee-bulb before he replied.

"Naturally you think in terms of heads of department, professors, assistants, tenure; it is what you are used to. Sometimes it works well and sometimes not; a great deal depends on the man at the top. So it does here, but the top men are not appointed; they are selected by the rest. Did you notice a group over there, quite a large group, who left all together just before I returned?"

"With rather a nice old bald guy pulling the strings?"

Marius gave her a small approving nod.

"They are working together on the design and development of marine ecologies. That is their choice. Each of them when he arrived—or she—was assigned certain responsibilities—"

"Hold on. I thought you said there *were* no assignments in this place."

Marius sighed patiently.

"I said that nobody was assigned to

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work under or for anyone else. When people first arrive, they are assigned responsibilities—on the basis of their qualifications and abilities, and of what needs to be done. Assigned not by any person or even a committee, but by a computer. Almost always the newcomer is assigned to work *with* another person, so that she can be—shown the ropes."

"Sounds like a cop-out," remarked Sandy suspiciously.

"The other person is also selected by the computer, on the basis of his or her record—for achievement in the appropriate fields, but also for willingness to help and guide those who do not yet know their way around. The newcomer is expected to keep these responsibilities—if you like, to work at this job, only we do not speak of jobs here—for at least one month. After that she can request a new assignment, or put up a proposal for work to be done alone. It is not always accepted—maybe the work has been done already, or more experienced workers have proposals to modify it—but in no circumstances is anyone assigned responsibilities that they do not agree to take."

Sandy gave this suspicious attention.

"Yea, well, *sounds* good, but—"

"It is as good as we can make it. . . . What else do you want to know?"

"For a start, how *could* I work here? I don't know the language. I can't even make out what it is."

"Ah. We call it Standard. It was developed around 2600 A.D."

Sandy stifled a gasp.

"I'm not that much of a linguist—"

"Standard can be imprinted directly to the brain. That is how I learned it myself; also English."

"So that's—" She suppressed the comment. "Well, there's the usual stuff—pay. Conditions. Like that."

"Pay. . . ." Marius shrugged. "If you want money you can have it, but few people do. Food and accommodation are provided. Otherwise, just ask for what you want and it will be obtained."

"What, *anything?*"

"Within reason. For your work, anything at all. Though if it is equipment that cannot be obtained without a great deal of trouble—for instance, a machine restricted to the laboratories of one of the more paranoid governments—the Purchasing Department may suggest alternatives. Often there will be an improved model on general sale in twenty years or so.

"For your personal use, or pleasure, anything that can be obtained through one of our purchasing stations would be supplied without question. But other items. . . ." He paused, thoughtfully. "A man asked for a Shakespeare First Folio once. It was available, of course, from the printers, in 1623; but the Purchasing Department decided that it would use up too many man-hours of an agent's lifetime, and suggested he should go and buy it himself. They supplied the appropriate cash and clothes, but what with learning to wear them, acquiring the accent and vocabulary—from imprinting tapes, but he had to practice afterwards—and having to go through full-body decontamination when he returned, it took up

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the whole of his annual leave. He wanted to fit in some performances at the Globe, but—"

"Hold on," said Sandy urgently. "Decontamination?"

"Why do you think we are wearing these suits? Bacteria and viruses that are harmless in a period when people have acquired immunity, may be extremely troublesome here. If you agree to join us, you will have to go through decontamination. It takes a couple of days. It is done under electroanaesthesia, so there is no unpleasantness—except for a feeling like a very mild hangover, which lasts for an hour or so. I have taken it several times . . . but always for some serious purpose. Money is plentiful here, but we do not waste lifetime."

"Where do you get your money from, anyway?"

"Access to past times," said Marius patiently, "enables us to acquire goods quite legitimately, which can be sold for large sums in more recent place-times. For instance there is a source of very fine emeralds in Eocene Patagonia, in rocks subducted long before the appearance of the genus *Homo*. Works of art can be bought at source for a fair price, and sold centuries later for a thousand times as much. The money is then invested, and can be drawn on at need."

Sandy was beginning to feel lightheaded. There were more questions that ought to be asked—things any right-minded scientist would want to know about, like superannuation and holidays and medical services, and she couldn't bring herself to give a damn. . . . Well, Marius's latest demonstration had answered at least one of them. Compare the crowd who had just walked out of here with the College faculty; plenty of oldsters, but they walked like forty-year-olds, not a creaking joint amongst them and not a pill-box in sight. . . . And all those cups stacked on the serving tables had just quietly disappeared when she wasn't looking, so no likelihood of finding herself on a washing-up rota. . . .

She said "This decontamination thing—do we have to go through it every time we go outside this place?"

"To visit place-times in human history—if you feel an overpowering urge to visit your old neighbourhood, or watch some famous theatrical performance—yes, you must go through Decontamination on your return. It is not so bad, after all. But also, there are holiday places—resorts—in eras where human diseases have not yet evolved; winter sports in the Pleistocene, a ranch in the South American Pliocene, tropical islands in the Lias Sea. . . . A month's holiday in each lifetime year. Short breaks whenever you want them, since they need not interrupt your work."

The Lia Sea. Ammonites, Ichthyosaurs. Plesiosaurs. Even for a specialist on microorganisms, unbelievably exciting.

Unbelievable. That was the word.

Sandy swallowed, hard, and sternly banished the vision of Jurassic rockpools. She said, "Why me?"

"I beg your pardon?"

"With what you're offering you could take your pick of all the biolo-

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gists from Darwin on. Nobel prize-winners, the lot. I haven't even got my Ph.D."

"How could we recruit Darwin? He lived on Earth until he was seventy-four, when he died. We cannot change history; we do not try."

"Yes, well—half the people in my year got better marks than me."

Marius frowned.

"In the first place, whatever your marks may have been, you have a rare and extremely useful skill—you are a genius at keeping small organisms alive in the absence of bacteria. Many biological students are good at passing exams, but very few of them have your green fingers."

Sandy's eyes opened wide. Only strong disciplinary action prevented her mouth from following suit. Of *course,* terraformers would want to control the species of bacteria and so on that got into their brand new worlds. They wouldn't want to bring in water-borne pathogens like typhoid bacteria, or soil-borne ones like *Clostridium tetani* and *botulinum.* Or spores of potato-blight or the eggs of parasitic worms or other agents of catastrophe to men, animals and crops. Of *course* that meant they couldn't just import soil or pond-water, complete with all inhabitants. . . .

"In the second place," Marius went on, "most people are not available for recruitment. To come here is to cut one's self off completely from previous contacts. There is no going home."

"You mean people aren't allowed—"

"Oh, if they really want to leave it is not prevented. I know of three instances—no, four. All of them people who had hoped to use Donander's facilities for political ends, but found they could not. They were let out at the place and time they chose, with enough money for a year or so, and given help where possible—in finding employment, for instance—but as scientists, their careers were finished. What could they put on a CV? Now, we avoid recruiting people with strong attachments to causes, or personal ties to families or friends—"

"You'd rather have unpopular orphans," said Sandy, with a touch of bitterness.

"There are people here whose families or friends were lost—in accidents, in massacres, in natural catastrophes. Others had their careers destroyed, or aborted, through racial or national or religious persecution. It would be stupid to try to recruit people who are happy, and have good prospects where they are. It is hard enough to leave behind everything you ever knew; even if you have not found very much in it to love. And it is a very considerable strain to have to adapt yourself to a wholly new situation, where any and all of your assumptions may turn out to be wrong."

"Yea, sure. I've been a freshman, remember? And I've been switched from one fosterer to another three separate times."

"You may well be better prepared than most. Even so, if you decide to come to Donander you may find that you have more regrets than you expect."

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"What the hell—are you trying to put me off?"

"No, but I do not wish you to say, at some time when you are finding things difficult, that I did not warn you how it would be."

Sandy sniffed. "Don't worry, I won't—if I decide to come."

When she stepped back through the interface into the laboratory, Sandy was clutching a legal-sized envelope containing a letter from the manager of a small pharmaceutical firm, offering her a job.

She had said irritably, "So you got the cover story ready. You must be pretty certain which way I'm going to decide!"

Marius shook his head. "Not at all. If you tried to give me your decision now, I would refuse to hear it. The job is genuine. If you decide in the end that Donander is not for you, the firm will be glad to have you. It is one of the investments I mentioned; profitable, and useful in many other ways.

"If you decide to come—well, when people remember Sandy Jennings, it should not be as someone who disappeared suddenly without saying goodbye, but as the girl who has taken a good job on the other side of the country. We do not leave people unaccounted for when they have been recruited. It is antisocial to make mysteries."

So, whichever way it went, she was provided for.

Much experience of welfare workers had left Sandy with a strong distrust of other people's plans. They always thought they knew what was best for you, and they never, ever asked what *you* thought. . . .

Something—maybe just an association of ideas with the envelope in her hand—had taken her in the direction of the pigeonholes. By the time she noticed Danny, it was too late to draw back.

He gave her a serious, commiserating smile.

"Sandy. I heard about your grant. Too bad."

She ignored him in favour of the stuff in the J pigeon-hole—plenty of increase since she last looked. Including a stamped envelope addressed to her. Good-quality paper. Another turndown from a Foundation, probably.

She took it round a corner and ripped it open.

Not a Foundation, some jerkwater college. She didn't remember if she'd ever heard of it.

Dear Miss Jennings,

Thank you for your letter.

(Presumably she *had* heard of it, then. Or anyway, it was on the list of colleges where biology was taught.)

I was much interested in your research and would be pleased to offer you facilities to complete your Ph.D. In return, you would be asked to make available, every six months, sufficient quantities of up to six of your cultures, for studies on—(DNA, of course; wouldn't you know?)

She skimmed through the rest of it,

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barely noticing the proposed terms; grant barely enough to live on (well, she could always get a part-time job waitressing or something, or grading papers for the biology faculty); available facilities—pretty good, they must have some kind of medical or industrial tie-up; help in finding accommodations. . . .

Sandy read the letter again. Then she folded it and put it back in the envelope.

It was nice that somebody really wanted her—or her fifty-three cultures. And it was the kind of setup she knew and understood. And getting her Ph.D had been her goal in life for as long as she could remember. If Donander gave doctorates they wouldn't count—no accreditation. . . .

None of which mattered a damn. There was nothing, really, to think about; the decision had been made, in effect, when she saw the scum of algae on those tidal pools, under two alien moons. If there was a biologist anywhere who could turn down a job bringing life to brand-new worlds, it was not Sandy Jennings. Especially when the job included opportunities to explore life on the *old* world, back when it was new—or much younger, at any rate.

She should have given Marius her answer right away, whether he wanted it or not. What, after all, was she supposed to think about? There was nothing here that she needed, nothing for her to regret—

Except—

Her fingers tightened suddenly on the envelope.

Except—

No. She had the offer of a brand-new life, a clean break with the old one. The past didn't matter any longer.

Except that it did.

There were white marks on her fingers where the stiff edge of the envelope had cut into them. She fumbled back the flap and searched through the papers inside. The card she wanted had gone to the bottom, naturally.

Marius had told her to call the number on the card, recite the number of the phone she was using to the answering machine, ring off, and stay where she was for two minutes; then, whichever universe he happened to be in, he would reply. She occupied the two minutes by trying to work out how it was done. On the deadline, the phone buzzed.

"This is Sandy. I have to talk to you."

"Where?"

"The laboratory." There was no one else around.

"Five minutes," Marius said.

She was watching the wall, expecting him to come through it; but instead she heard the door open and brisk footsteps crossing the wooden floor. He pulled a stool from under a bench and sat down opposite her.

"Well, Sandy. What is wrong?"

"It's not—that is, I—I wanted to know—"

Oh, damn. She should have spent the five minutes working out what she had to say, instead of just sitting here.

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Sandy drew a deep breath and started again.

"You've got ways of finding things out, haven't you? What happened in the past, I mean."

Marius pursed his lips. "Some things, yes."

"You found out about me. That I don't know my own name or where I was born. That my mother abandoned me when I was four years old."

"We have facilities for obtaining any information that is on record. What is it you want to know?"

"*Why* Mom ditched me that way. What happened to her and Da. *That* isn't on record. I went to the police, when I was old enough. They looked the case up. Some officer'd tried to trace how I got to town. No dice. But you can—can go places in the past. So you could send *me* back—I know who to talk to—"

"No. Absolutely not." Marius frowned heavily. "Obviously they were involved in something dangerous, and—no." He chewed his lip in the first sign of indecision Sandy had seen him show. "But if you really wish to know—"

"Of course I do! Anybody would! I can't just— Do you mean *you* know—"

Marius appeared to make up his mind.

"Yes. It is not true that the police failed to trace you, though whoever told you that may have believed it. The records would not be available to him. They had been classified."

"*What?* But Mom and Da—they weren't—"

"They had been—I think the expression is *put into a relocation program*. By the FBI. I found a coded cross-reference in the police report and was able to trace and access the file concerned."

"Well, go on," said Sandy, as he paused.

"It is not an agreeable story."

"I never thought it would be. I just want to *know*."

"Very well. Your father was a member of a criminal organisation. Not the Mafia; a smaller and more ephemeral group. He was arrested and charged with several crimes, some of them committed by other members of the organisation. He felt that he was being made a fall guy, and the FBI persuaded him to testify against those responsible."

A detached part of Sandy's mind registered that Marius's slang was out of date.

"He was taken from custody to a safe house and an officer dispatched to collect your mother and you. It seems that your mother had no faith in the FBI's promise of safety. She gave the officer a cup of coffee containing several sleeping pills, and left, with you, on a bus journey. The next part I imagine you know."

"It said in the report I walked into the police station and said Mom told me to come and play. I don't remember it."

"Yes. I gather the officers were somewhat confused. Also, you recited your address. It took some time to establish that the street you named did not exist in that city. Meanwhile your mother made her getaway and took the next bus home. You were

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eventually taken to an orphanage, as a temporary measure. The police traced you the following day to your parents' flat, but it was empty. The FBI, hearing that questions were being asked, got hold of the investigating officer and told him to drop the matter."

"But—damn it—"

"They seem to have taken the view that you were probably safer where you were. Also, you were conspicuous. The police were able to trace your journey because the bus driver and several passengers remembered a small red-haired girl, very forward for her age, who kept asking questions. They felt that the relocation program would have a better chance of success if your parents were alone."

Sandy swallowed something bitter. "That stinks!"

"Very likely your parents hoped that in a year or two, when the whole organisation was behind bars, it would be practicable to claim you—"

"Like hell. They never even tried!"

"That," said Marius slowly, "was, I am sorry to say, because they were both dead. They were killed in a head-on collision, six months after your father appeared on the witness stand. It was recorded as a genuine accident—the other party in the collision was also killed."

Sandy was silent for a long time. Then she said, "I suppose I knew it had to be something like that."

Marius did not attempt to reply.

"When they arrested him—was that at home?"

"I don't—yes. I think it was."

"The man who did it—was he a big man?"

Marius blinked. "The report does not say."

"I suppose it wouldn't say whether he sounded like you."

"Like me. . . ?" For a moment Marius looked blank. "Ah. You mean my Hungarian accent, I suppose. I have been told that it still lingers. . . . No, the report does not say. I noticed that the officer's surname was a Hungarian one, though I can't recall it more exactly. If he was a first-generation immigrant—but I don't know that, either."

"I reckon he was."

She ought to be feeling grieved, Sandy supposed. Or at any rate feeling *something*. She was aware only of a kind of emptiness, as though something deep in her mind had been dug out and disposed of. It had all been a long time ago.

Marius said, "Is there anything else you need to know?"

"Guess not. . . . When do I start?"

"When do you come to Donander?" He gestured toward the envelope. "Have you read the list of matters that have to be dealt with first? They will take four or five days at the very least. I suggest we make it a week from today. I will get in touch to arrange where we meet. Do you need money for anything?"

"No. Rent's paid to the end of the month. There's a bit of my grant left."

"Let me know if you need more." He got to his feet, gave her a long, assessing look, and went away.

For some time Sandy continued to sit on her stool, letting thoughts drift in and out of her mind. She wondered

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whether her mother had really been concerned about her safety, or just that she might draw attention to her and Da. No way to tell, now; no way at all. Even if Marius had let her go back.

Well, she had learned a long time ago that it was no use brooding over things that were over and done with. . . . Sandy straightened up and opened the envelope Marius had given her. Did his notes on Things To Be Done in the next five days include instructions for the safe transportation of fifty-three bacteria-free cultures of ciliates? She fished out the papers and began to read. ■

IN TIMES TO COME

Our lead novella for September is, appropriately enough, "Touchdown, Touchdown, Rah, Rah, Rah!" Yes, it *does* contain a football player; but it's also one of the funniest of W. R. Thompson's "kya" stories, and quite thought-provoking to boot. That football player, for instance, does have an athletic scholarship; but it's also part of an exchange program, and football isn't exactly what he's being asked to play. Have you thought about what *kinds* of games a species descended from herbivorous herd animals might develop?

Our fiction lineup also includes a couple of special treats from writers too long absent from our pages. There's a new Rhys Llewellyn tale from Maya Kaathryn Bohnhoff, wherein an archaeologist gets a rude reminder of the perils of coming to his research with too many ideas about what he *wants* to find; and a haunting new short story from Marc Steigler.

It's not unusual for us to present an imaginative new concept in space travel, but it *is* unusual for one to come to us quite the the way next month's fact article did. Somewhere out there is a reader who's been doing a lot of interesting speculation on a wide range of topics and sending it to us and several researchers anonymously, identifying himself or herself only as "Midwest Amateur Futurist" or "MAF" and inviting any of the recipients to do what they will with his or her ideas. We're usually skeptical of such anonymous submissions, but Dr. Gregory L. Matloff, coauthor of *The Starflight Handbook*, found one idea there that tickled his fancy, held up under scrutiny, and led directly to next month's article. So, MAF, whoever and wherever you are, thank you!

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Doug Beason

BACK TO THE MOON– AT LAST! THE CLEMENTINE SOLUTION

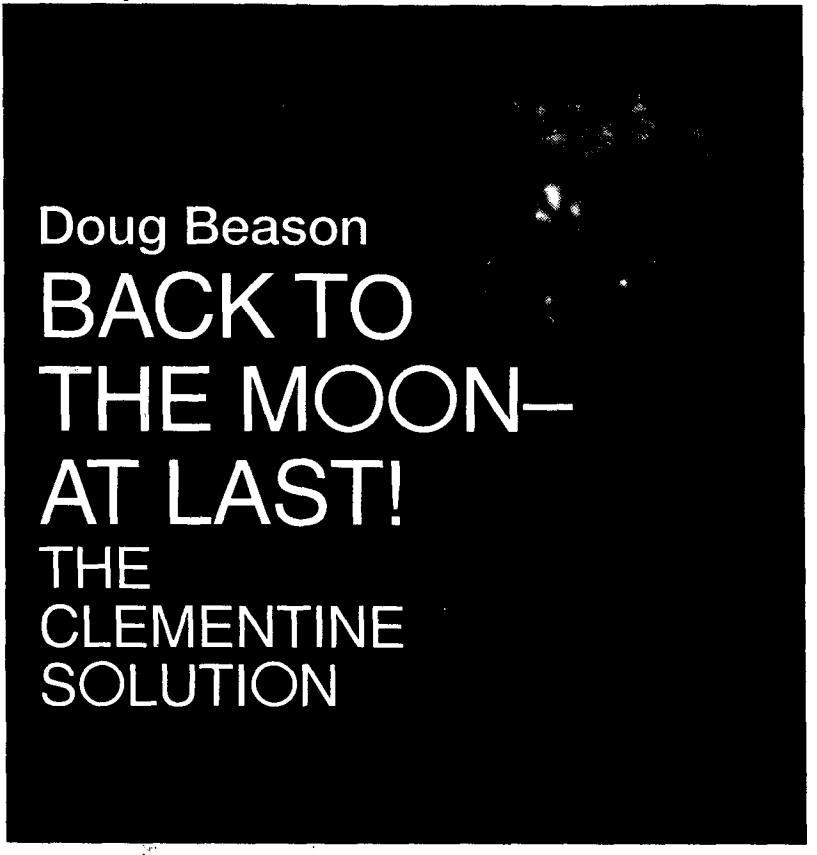

Figure 1:
A composite picture of the Earth and lunar surface staged in an *Apollo*-like setting, these images were made from Clementine sensors.

"Oh my darlin', oh my darling', oh my darlin' Clementine. . . ."

A quarter of a century ago, *Apollo 11* was suppose to have ushered in a new era, one of hope, one of fulfilling mankind's dream of setting out to conquer the stars. For we had done the impossible—we had sent Man to the Moon, and Mars was just around the corner. . . .

But twenty-five years after Neil Armstrong first set foot on the Moon, humans had not ventured to within a quarter million miles of the lunar surface. And in the two decades since *Apollo 15* had rocketed off the face

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of the Moon—hopefully *not* the last time Man will have visited another planet—the most that mankind has accomplished in space was to barely skim above the atmosphere, tiptoeing out from the Earth not more than a few hundred miles.

Politicians, spiraling budgets, and a lack of public interest killed the nation's lunar effort. People questioned the wisdom of even *going* into space, killing the motivation for exploring the rest of the Solar System.

And until January, 1994, it looked as though mankind was doomed to follow Robert A. Heinlein's grim prophetic timeline of turning its back on space travel—his infamous "Crazy Years"—and perhaps not going back into space forever.

But recently a technological revolution has bubbled throughout the U.S. space industry . . . a radical new mind-set, far removed from the myopic policy of building massive, multiple-redundant systems; a turn away from the gold-plated "cost-is-no-factor" mentality. This revolution is summarized in the mantra popularized by NASA administrator Dan Goldin: *faster, cheaper, better.*

Clementine, mankind's first satellite to the Moon in over a quarter of a century, is just the tip of the iceberg. It is the first product in an astonishing new wave of technological innovation that embraces a cradle-to-grave philosophy of this "faster, cheaper, better."

So instead of spending a billion dollars over a decade to launch a mission-to-end-all-missions—that is, the space age equivalent of lofting a battleship into orbit—the Clementine paradigm is to field quick reaction test beds, designed to focus technology *so that the nation can afford to get back into space.*

And once the nation is back, then a flood of new technologies—and advances in virtually every field to benefit mankind—is sure to come.

We've already seen the first such advance for science: knowledge of lunar geology.

High resolution mapping of the lunar surface by the *Apollo* spacecraft covered a relatively thin band about the Moon's equator. The position of this band was dictated by the lunar equatorial orbit flown by the *Apollo* missions. In contrast, Clementine was flown in a *polar* orbit, allowing for a complete mapping of the lunar surface.

Today you can even pull down actual Clementine data that have been transmitted back to Earth and archived on Internet. These pictures, taken with multiple filters to provide 1.7 million high-resolution images in 13 different wavelengths ranging from infrared (thermal radiation) to deep blue, have shed new light (no pun intended!) on lunar mineralogy. These images comprise the most highly detailed multi-spectral mapping of *any* celestial body . . . comparable to that of Venus, obtained by Magellan, and even exceeding that which we have of the Earth. For example, Clementine laser altimetry has mapped new lunar basins, undetected until now, hidden from even the most powerful of Earth's telescopes.

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To gain access to Clementine images via the Internet, perform an anonymous FTP into:

clementine.sl.gov

and for Mosaic access, log into:

http: //www.llnl.gov

and click on the spacecraft figure.

Clementine is gaining recognition as a landmark experiment, and even more importantly, as a completely new paradigm for the way things ought to be done.

At the 1994 Wenher von Braun lecture given at the Smithsonian National Air and Space Museum, D. Allan Bromley, Science Advisor to President Bush and now Sterling Professor of the Sciences and Dean of Engineering at Yale, said that a " . . . resolution to some of our most pressing problems in space science comes from a little known, but enormously important space probe—Clementine. . . ."

Dr. Bromley went on to urge that this philosophy be adopted by recommending that NASA " . . . exploit modern miniaturized, off-the-shelf commercial products and technology that works now, not in some distant future."

"... *a miner, forty-niner*..."

Named after the daughter of that California gold miner in 1849, Clementine is a lightweight, low-cost spacecraft built with an experimental flavor—that is, it uses advanced technologies that are currently off-the-shelf, gathered from a variety of fields and assembled to produce a vehicle more reminiscent of the "daring days of old," rather than the risk-free caution used by many people and technical organizations today.

By using off-the-shelf, state-of-the-art components that are currently fielded in high-tech equipment, development costs were cut to almost zero. For example, composite plastics were substituted for some metal parts; a heavy rotating gyroscope was replaced by a highly accurate ring laser; and bulky tape drives were replaced by solid state memory and highly optimized software.

A historical analogy would be the aircraft industry trying to build the DC-3 out of wood. Wood is a trusted, tried and true material that entails little risk, and was successfully used to build lumbering behemoths such as biplanes.

But contrast this to building the DC-3 out of off-the-shelf "exotic" materials such as aluminum, which resulted in the world's flagship cargo carrier.

Acceptable risks are what pushed the technology, and that's what makes the difference. Clementine: faster, cheaper, better. It's a true satellite for the people.

With the actual satellite having an unfueled dry weight of 500 pounds, the entire space vehicle—including launch adapter, kick motor, interstage platform and spacecraft—weighs an astonishingly low 3,720 pounds, a factor of 3 to 10 times less weight than "normal" satellites. The science package alone weighed a minuscule 18 pounds.

Clementine was funded, designed,

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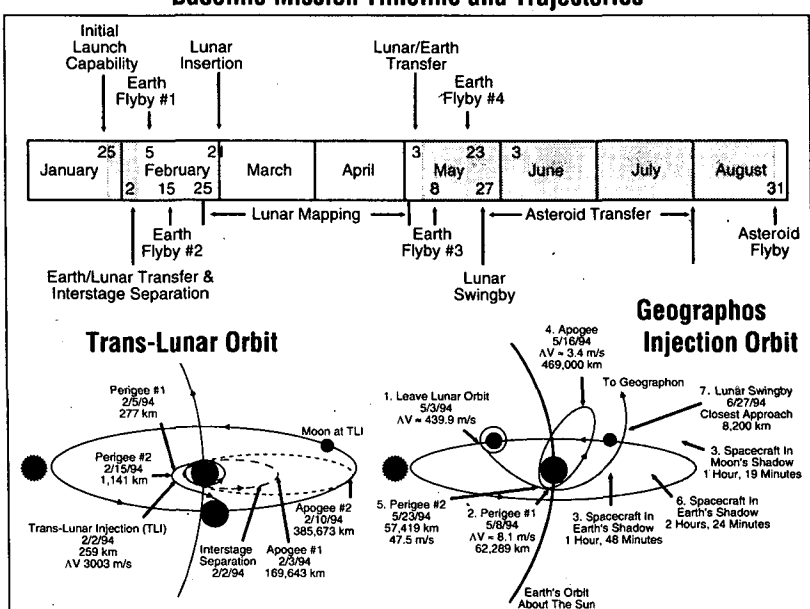
built and launched in less than three years and done so *fully* under budget at a cost of $80 million. The spacecraft cost $55 million, the launch $20 million, and the operating costs for the mission came in at just under $5 million. Compare this to an average satellite that has a ten year program lifetime before it's even launched!

The secret of Clementine's success, of course, lies in miniaturization and leveraging "off-the-shelf" technology. And if you're worried about failure, it's cheaper to build ten of these spacecraft than it is to build one massive "battlestar"—and even with a 90% failure rate (i.e., nine out of ten Clementine-like satellites failing), you've *still* got a 100% mission success.

The Clementine "smallsat" was launched on January 25,1994, on top of an Air Force Titan IIG rocket into a 160 by 140 nautical mile elliptical orbit about the Earth, inclined at 67 degrees from the equator. As the prime launch contractor, Martin Marietta had refurbished 14 Titan II Intercontinental Ballistic Missiles (ICBM) for the USAF Space and Missile Systems Center for space use. Low cost, combined with the proven success of 12 Gemini launches and 81 ICBM launches from 1962-1986, made the Titan II a natural choice as the launch vehicle for this light-weight satellite.

After undergoing numerous system checks, engineers at the Arlington, VA, mission control—dubbed the "Bat Cave" because of its cavern-like features in a refurbished old warehouse—boosted Clementine into a

Baseline Mission Timeline and Trajectories


Initial Launch Capability
Lunar Insertion
Lunar/Earth Transfer
Earth Flyby #1
Earth Flyby #4
January 25
February 5 15 21
March
April
May 3 8 23 27
June 3
July
August 31
Lunar Mapping
Asteroid Transfer
Earth Flyby #2
Earth Flyby #3
Asteroid Flyby
Earth/Lunar Transfer & Interstage Separation
Lunar Swingby
Trans-Lunar Orbit
Perigee #1 2/5/94 277 km
Moon at TLI
Perigee #2 2/15/94 1,141 km
Trans-Lunar Injection (TLI) 2/2/94 259 km ΔV 3003 m/s
Interstage Separation 2/2/94
Apogee #2 2/10/94 385,673 km
Apogee #1 2/3/94 169,643 km
Geographos Injection Orbit
4. Apogee 5/16/94 ΔV = 3.4 m/s 469,000 km
To Geographon
1. Leave Lunar Orbit 5/3/94 ΔV = 439.9 m/s
7. Lunar Swingby 6/27/94 Closest Approach 8,200 km
3. Spacecraft In Moon's Shadow 1 Hour, 19 Minutes
6. Spacecraft In Earth's Shadow 2 Hours, 24 Minutes
5. Perigee #2 5/23/94 57,419 km 47.5 m/s
2. Perigee #1 5/8/94 ΔV = 8.1 m/s 62,269 km
3. Spacecraft In Earth's Shadow 1 Hour, 48 Minutes
Earth's Orbit About The Sun

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Trans-Lunar Injection orbit by a solid rocket booster on February 2. This solid rocket "kick" produced a change in velocity (called delta v) of just over 3,003 meters per second.

The spacecraft used two gravity well boosts before reaching lunar insertion, flying by Earth on February 5 for the first boost with a perigee of 277 kilometers; the second gravity boost occurred on February 15, with a perigee of 1,141 kilometers. Apogee before the first flyby was reached on February 3 (169,643 kilometers) with the apogee before the second flyby occurring on February 10 (385,673 kilometers).

During the Trans-Lunar Injection, after the solid rocket motors had fired, interstage separation occurred on the way to the first apogee on February 2. The jettisoned interstage and solid rocket motor platform was used for 90 days as its own experimental satellite.

Long term radiation effects were studied by the jettisoned platform, and information was relayed back to Earth during the platform's 350 by 172,000 kilometer elliptical orbit. The platform sent back information on space debris, the radiation environment and micro-electronic interaction with electromagnetic fields and particles.

The main satellite's lunar insertion was made to a "high-noon" polar orbit on February 21, and multi-spectral imaging began four days later on February 25. Clementine took two lunar "days" (nearly two Earth months) to completely cover the Moon's surface. This occurred while the Sun was at the nearly "high-noon" local location for all features on the lunar surface.

This work was performed under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

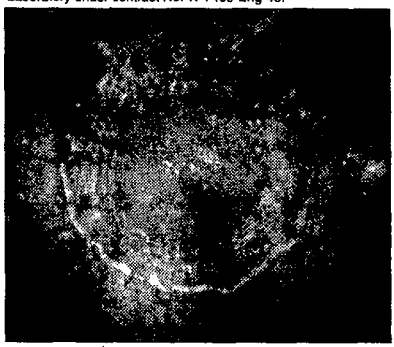

Figure 2: Copernicus Crater shown from a height of 550 km is resolved through a 1 micrometer filter.

The onboard sensors consisted of:

- Two Wide Field-of-View Star Trackers (weighing 290 grams each) for stellar navigation. The trackers provided a highly accurate inertial frame by comparing images of the stars with an internal map in the satellite. This allowed Clementine to precisely calibrate its sensors, a feature receiving much attention in the scientific community.
- A Medium Resolution Ultraviolet/Visible Camera (410 grams) used a 384 by 288 element Charge-Coupled Detector (CCD) with six filters, allowing passage of five bands of light ranging from 415 nanometers to 1,000 nanometers plus broadband radiation. From 400 kilometers above the lunar surface, this 4.2 by 5.6 degree field-of-view sensor was able to resolve objects 100 meters on a side.

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- A High Resolution Camera (1,120 grams) used a 384 by 288 element CCD with six filters to resolve objects 20 meters on a side from 400 kilometers with a 0.3 by 0.4 degree field-of-view.
- A Laser Transmitter (640 grams) used a diode pumped Neodymium YAG laser for high resolution altitude measurements. The 0.18 joule, 10 nanosecond long pulses could measure altitude with an accuracy of 40 meters from 640 kilometers above the surface.
- A Medium Resolution Near Infrared Camera (1,920 grams) used a cooled 256 by 256 element InSb CCD with six filters ranging from 1,100 nanometers to 2,960 nanometers (near to short wave IR) to resolve objects 150 meters on a side from 400 kilometers with its 5.6 by 5.6 degree field-of-view.
- A Long Wave Infrared Camera (2,100 grams) used a 128 by 128 element CCD to resolve objects 50 meters on a side from 400 kilometers with its 1. by 1. degree field-of-view in the long wave (8,000 to 9,500 nanometers) infrared.

"... You are lost and gone forever...."

Lunar mapping was completed in two months on April 29, 1994. In May, Clementine thrusters were readied for the next phase of its ambitious mission—a high-speed flyby of an asteroid.

A software error prevented this last phase of the mission from being accomplished, and Clementine is now in a solar orbit while the status of the small satellite is still being evaluated.

But the main mission was a complete success, and the nation was back to the Moon, big time. And it didn't take a billion dollars—and a decade—to get there.

Clementine's polar orbit enabled the craft to map the elusive higher lunar latitudes in detail that has never been done before. And as mentioned earlier, for the first time, multi-spectral imagery beamed back to Earth has been gathered and stored on the Internet for public access.

On the 25th anniversary of the *Apollo 11* landing, a team of government, national laboratory, and contractor scientists brought high-resolution graphic computers into the White House with a CD containing digitized data from the spacecraft. Officials from the White House were then shown a virtual reality flight over the lunar surface; all this within three years of Clementine being conceived.

The Dream Is Alive—not in megatons of equipment to orbit, but rather in microvessels to the Moon.

And the next step is to prove the usefulness of space in a cheap, profitable manner; after that, gaining access with larger vehicles is simply a matter of scaling up. It's the age-old wisdom of trying something on a small scale, then working up from there . . . kind of like testing out your scuba equipment in a swimming pool before heading for the ocean.

How could the nation pull off this technological feat, when just a few years ago it seemed that everything

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This work was performed under the auspices of the US Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.

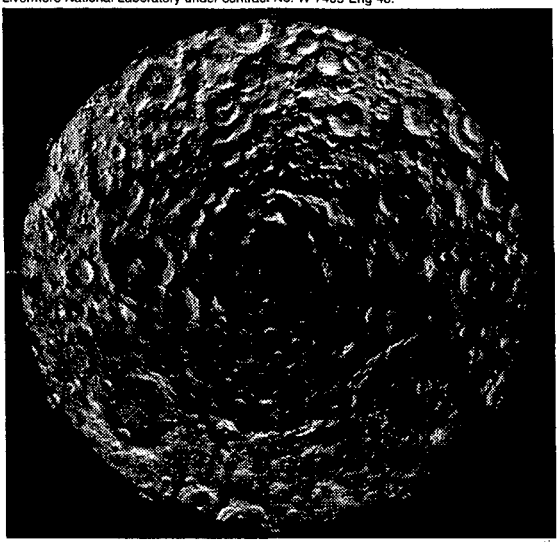

Figure 3: The Moon's South pole is shown from a composite of images. Note the dark southernmost craters where quite literally the sun never shines.

we tried in space was somehow bungled up? *Challenger,* Hubble space telescope, *Mars Observer* . . . the list goes on. What happened to turn this streak of bad luck around?

The answer lies in a mind-set first embraced by a group known as the "Skunk Works," an enthusiastic bunch of can-do engineers housed in the remote California desert by Edwards Air Force Base. Edward's legacy is steeped in aviation history, from General Chuck Yeager's speed-of-sound breaking flight in the *Glamorous Glennis*, to the USAF Test Pilot School, to the present-day alternate landing site for the space shuttle.

Lockheed's Skunk Works was headed up by Kelly Johnson, a man renowned for his no-nonsense, straightforward style of aircraft design. Kelly Johnson, working without the constraints dictated by bureaucratic beancounters, was allowed to be completely responsible for his projects and given authority for making decisions—while being held totally accountable for the results.

The Skunk Works took risks to develop generation after generation of new aircraft: the F-104, U-2, SR-71, F-117. . . . And they were wildly successful.

The aircraft industry has *always* taken risks such as those, employing state-of-the-art technology, always pushing the envelope on what could be done.

But the space industry, with very little exception, has never followed this route. The argument goes something like this: getting into space is so expensive that we can't afford for anything to go wrong—so we have to

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make sure it *never* goes wrong, which drives the cost up.

And when the cost goes up, we need to make sure that nothing goes wrong. . . .

You see where this is heading: A vicious circle of increasing cost, designed to lower the risk.

The fresh breeze of change to stop this numbing repetitiveness blew in from a most unlikely place—the U.S. military. And given the often misunderstood reputation of the stodgy, unwilling-to-bend military, it's constructive to see that this "fresh breeze of change" more *follows* the military tradition than goes against it.

The government, and the military in particular, has had a long history of pushing the envelope, going "where no man has gone before," and pushing into those unexplored regions where the profit motive has not yet been established. American history gives example after example: Lewis and Clark, two military officers sent out to explore; the US Army Air Corps, shoved into subsidizing airmail; Army posts on the frontier.

These endeavors were not established to create new opportunities; rather new opportunities later sprung up to supply a need—a market for resupplying the forts, for example.

Even the voyages of Darwin can be traced to the government allowing him passage onboard a military ship. His science was performed as an "add-on," and not as the primary mission; but we all know what made history.

SDI—the Strategic Defense Initiative, commonly known as "Star Wars" and now known as BMDO, the Ballistic Missile Defense Organization—*had* to adopt a new philosophy, because their mission of sending up thousands of space-based interceptors would simply break the bank if things were done "business as usual." So program managers like Dr. Mike Griffin, Brigadier General "Pete" Worden, Dr. Stewart Nozette and others, empowered with the blessing of their bosses and taking a hard-charging attitude, initiated several innovative experiments that capitalized on using miniaturized circuits, new engine technologies . . . and even new *management* techniques to put into practice *faster, cheaper, and better.*

The new management techniques are not inconsequential, and they may even be the most far-reaching of all the changes:

- Small program offices
- Decision authority for major changes residing at the lowest level
- Improved, streamlined procurement authority
- Exploiting off-the-shelf technology
- Using the right people—and not just the local bureaucrat—for the job

The Clementine management structure was as revolutionary as the technology. And government agencies are already inquiring about this new paradigm—hopefully to apply these "lessons learned" to other pressing national needs.

You've already read about one product of this new "can do" philosophy in *Analog*, Dr. Arlan Andrews's "Single Stage to Infinity!" article, de-

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tailing the Single-Stage-To-Orbit scale test of the DC-X (June 1993).

Clementine is simply the latest program to hit the streets . . . brought to you by the same people that brought you DC-X. And the exciting thing is that there are *more* experiments planned—so stay tuned. Designed and constructed by the Naval Research laboratory with advanced science packages built by the Lawrence Livermore National Laboratory for BMDO, Clementine is truly a revelation of the future.

But not everything is salubrious and copacetic. There's danger that some of these programs could be canceled. The budget cuts are affecting *everything* at a national level. And if that's not bad enough, there are some people who are so firmly entrenched in the bureaucracy that they are convinced that if they didn't think of whatever is new, then it's not a good idea. It's using the twisted logic of "if it's so easy, we would have done it before"—another way of preaching NIH, or "Not Invented Here."

But for all the nay-sayers, the doom-and-gloom techno-Luddites that permeate the system, Clementine pierced the darkness with a flash of revealing light: it worked!

For the first time in two decades, the nation had shrugged off the plethora of paper studies, the endless campaigns of "Vu-graph wars," where everyone claimed to have a better solution. For unlike the paper studies, Clementine was real—an artificial satellite that actually circled the Moon.

And it didn't break the bank to get there.

Faster, cheaper, better.

The criticisms can stop and everyone can climb aboard the bandwagon, because you can't argue with success. Humans *can* get back into space, and do more than just skim outside the atmosphere. So let's continue the "can do" *Apollo* legacy—but instead of mimicking the disastrous post-*Apollo* methodology, let's do it smarter this time. ■

The views or opinions expressed or implied in this article are those of the author and are not to be construed as carrying the official sanction of the Department of Defense or the US Air Force.

The finest of all human achievements—and the most difficult—is merely being reasonable.

—Jane Bryant Quinn

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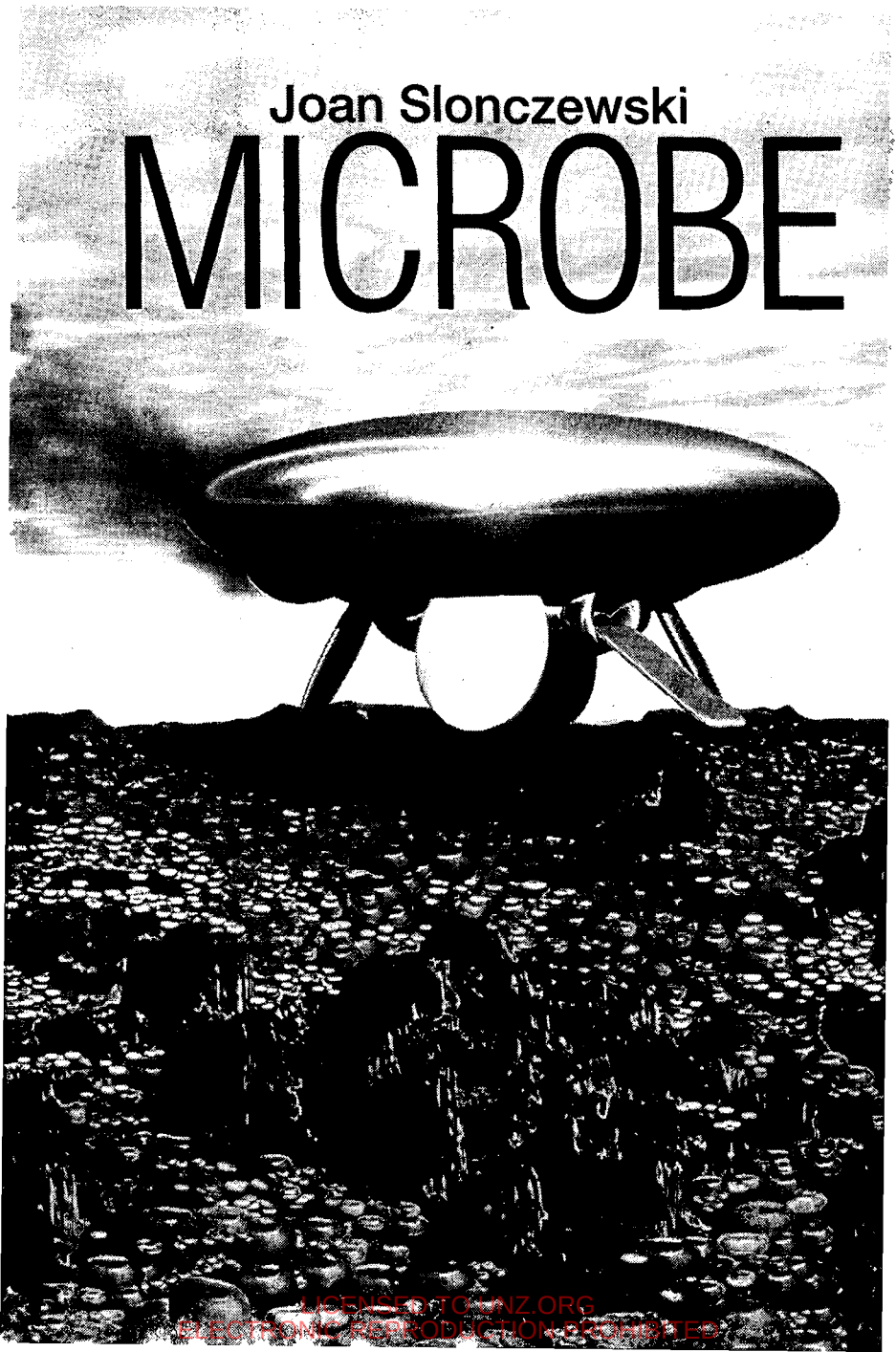
Joan Slonczewski

MICROBE



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Explorers need all the help they can get—but they can't anticipate everything!

Illustration by George H. Krauter

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"That rat didn't die." Andra walked around the holostage. Before her, projected down from the geodesic dome, the planet's image shone: Iota Pavonis Three, the first new world approved for settlement in over four centuries. As Andra walked around, the brown swirl of a mysterious continent peered out through a swathe of cloud. She stopped, leaning forward on her elbows to watch. What name of its own would the Free Fold Federation ultimately bestow on IP3, Andra wondered; such a lovely, terrifying world.

"Not the last time, the rat didn't." The eye speaker was perched on her shoulder. It belonged to Skyhook, the sentient shuttle craft that would soon carry Andra from the study station down to land on the new world. A reasonable arrangement: The shuttle craft would carry the human xenobiologist through space for her field work, then she would carry his eye on the planet surface, as she did inside the station. "The rat only died down there the first eight times."

"Until we got its 'skin' right." The "skin" was a suit of nanoplast, containing billions of microscopic computers, designed to filter out all the local toxins—arsenic, lanthanides, bizarre pseudoalkaloids. All were found in local flora and fauna; inhaling them would kill a human within hours. In the old days, planets had been terraformed for human life, like Andra's own home world Valedon. Today they would call that ecocide. Instead, millions of humans would be lifeshaped to live here on planet IP3, farming and building—the thought of it made her blood race.

"We got the right skin for the rat," Skyhook's eye speaker pointed out. "But you're not exactly a rat."

From across the holostage, an amorphous blob of nanoplast raised a pseudopod. "Not *exactly* a rat," came a voice from the nanoplast. It was the voice of Pelt, the skinsuit that would protect Andra on the alien planet surface. "Not exactly a rat—just about nine-tenths, I'd say. Your cell physiology is practically the same as a rat; why, you could even take organ grafts. Only a few developmental genes make the difference."

Andra smiled. "Thank the Spirit for a few genes. Life would be so much less interesting."

Pelt's pseudopod wiggled. "The rat lived, and so will you. But our nanoservos completely jammed." The microscopic nanoservos had swarmed into sample life forms from IP3 to test their chemical structure. But for some reason they could barely begin to send back data before they broke down. "Nobody cares about them."

"Of course we care," Andra said quickly. Pelt never let anyone value human life above that of sentient machines. "That's why we cut short the analysis, until we can bring samples back to the station. That's why we're sending *me.*"

"Us," he corrected.

"All right, enough already," said Skyhook. "Why don't we review our data one last time?"

"Very well." A third sentient voice boomed out of the hexagonal panel in the dome directly overhead. It was

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the explorer station herself, Quantum. Quantum considered herself female, the others male; Andra could never tell why, although sentients would laugh at any human who could not tell the difference. "Here are some microbial cells extracted from the soil by the last probe," said Quantum.

The planet's image dissolved. In its place appeared the highly magnified shapes of the microbes. The cells were round and somewhat flattened, rather like red blood cells. But if one looked closer, one could see that each flattened cell was actually pinched in straight through like a bagel.

"The toroid cell shape has never been observed on other planets," said Quantum. "Otherwise, the cell's structure is simple. No nuclear membranes surround the chromosomes; so, these cells are like bacteria, *prokaryotes.*"

Skyhook said, "The chromosome might be circular, too, as in bacteria."

"Who knows?" said Pelt. "On Urulan, all the chromosomes are branched. It took us decades to do genetics there."

"We just don't know yet," said Quantum. "All we know is, the cells contain DNA."

"The usual double helix?" asked Skyhook. The double helix is a ladder of DNA nucleotide pairs, always adenine with thymine or guanine with cytosine, for the four different "letters" of the DNA code. When a cell divides to make two cells, the entire helix unzips, then fills in a complementary strand for each daughter cell.

"The nanoservos failed before they could tell for sure. But it does have all four nucleotides."

Andra watched the magnified microbes as their images grew, their ring shapes filling out like bagel dough rising. "I'll bet their chromosomes run right around the hole."

At her shoulder Skyhook's eye speaker laughed. "That would be a neat trick."

Quantum added, "We identified fifteen amino acids in its proteins, including the usual six." All living things have evolved to use six amino acids in common, the ones that form during the birth of planets. "But three of the others are toxic—"

"Look," exclaimed Andra. "The cell is starting to divide." One of the bulging toroids had begun to pucker in, all along its circumference. The puckered line deepened into a furrow all the way around the cell. Along the inside of the "hole," a second furrow deepened, eventually to meet the furrow from the outer rim.

"So that's how the cell divides," said Skyhook. "Not by pinching in across the hole; instead it slices through."

"The better to toast it."

At that Pelt's pseudopod made a rude gesture. "Pinching the hole in wouldn't make sense, if your chromosomes encircles the hole; you'd pinch off half of it."

Andra squinted and leaned forward on her elbows. "I say—that cell has *three* division furrows."

"The daughter cells are dividing again already?" Skyhook suggested.

"No, it's a third furrow in the same generation. All three furrows are

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meeting up in the middle."

"That's right," boomed Quantum's voice. "These cells divide in three, not two," she explained. "Three daughter cells in each generation."

Sure enough, the three daughter cells appeared, filling themselves out as they separated. Other cells too had puckered in by now, at various stages of division, and all made their daughters in triplets. "How would they divide their chromosomes to make three?" Andra wondered. "They must copy each DNA helix twice before dividing. Why would that have evolved?"

"Never mind the DNA," said Pelt. "It's those toxic amino acids you should worry about."

"Not with you protecting me. The rat survived."

Quantum said, "We've discussed every relevant point. We've established, based on all available data, that Andra's chance of survival approaches 100 percent."

"Uncertainties remain," Skyhook cautioned.

Andra stood back and spread her hands. "Of course we need more data—that's why we're going down."

"All right," said Skyhook. "Let's go."

"I'm ready." Pelt's pseudopod dissolved, and the nanoplast formed a perfect hemisphere.

Andra unhooked Skyhook's eye speaker from her shoulder. Then she walked back around the holostage to lift the hemisphere of Pelt onto her head. Pelt's nanoplast began to melt slowly down over her black curls, leaving a thin transparent film of nanoprocessors covering her hair, her dark skin, and her black eyes. It formed a special breather over her nose and mouth. Everywhere the nanoplast would filter the air that reached her skin, keeping planetary dust out while letting oxygen through. The film covered the necklace of pink andradites around her neck, spreading down her shirt and trousers. She lifted each foot in turn to allow the complete enclosure. Now she would be safe from any chemical hazard she might encounter.

In Skyhook's viewport, the surface of planet IP3 expanded and rose to meet them. Numerous tests had established its physical parameters as habitable—gravity of nine-tenths *g*, temperatures not too extreme, oxygen sufficient and carbon dioxide low enough, water plentiful. The ozone layer could have been denser, but human colonists would have their eyes and skin lifeshaped for extra enzymes to keep their retina and chromosomes repaired.

At a distance the planet did not look remarkably different from Andra's home world. A brilliant expanse of ocean met a mottled brown shore, rotating slowly down beneath the craft. Beyond, in the upper latitudes, rolled the blue-brown interior of a continent, broken only by a circle of mountains.

As Skyhook fell swiftly toward the land, curious patterns emerged. Long dark bands ran in parallel, in gently winding rows like a string picture. The lines were bands of blue vegeta-

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tion; the probe had sent back footage of it, wide arching structures tall as trees. Each band alternated with a band of yellow, which gave way to the next band of blue. Over and over the same pattern repeated, ceasing only at the mountains.

"I've never seen patterns like that on uncolonized worlds," Andra mused.

"They do look like garden rows," Skyhook admitted. "Perhaps the native farmers will come out to greet us."

If there were intelligent life forms, they had yet to invent radio. A year of monitoring the planet at every conceivable frequency had yielded nothing, not so much as a calculation of pi.

Skyhook landed gently in a field of dense vegetation. The wall of the cabin opened, the door pulling out into an arch of nanoplast. A shaft of brilliant light entered.

"All systems check," crackled Quantum's voice on the radio in her car. "Go ahead."

Andra gathered her field equipment and set Skyhook's eye upon her shoulder again. Then she stepped outside.

The field was a riot of golden ringlets, like wedding bands strewn out. Her gaze followed the cascade of gold down to the edge of the field, where taller dark trunks arose in shallow curves, arching overhead. From the taller growth came a keening sound, perhaps some living thing singing, or perhaps the wind vibrating somehow through its foliage. "It's beautiful," she exclaimed at last.

Beneath the golden ringlets grew dense blue-brown vegetation, reaching to Andra's waist. She bent closer for a look. "These look like plants, 'phycoids.' The ringlets might be flowers."

"They could just as well be snakes ready to snap," warned Skyhook. "Watch your step."

She looked back at the shuttlecraft, planted in the field like a four-legged insect. Then she lifted her leg through the foliage, Pelt's nanoplastic "skin" flexing easily. Immediately her foot snagged. She tried to pull out some of the growth, but found it surprisingly tough and had to cut it with a knife. "The leaves and stems are all looped," she observed in surprise. "All looped, just like the 'flowers.' I'll never get through this stuff."

Pelt said, "They *are* phycoid. I detect products of photosynthesis."

"They could be carnivorous plants," Skyhook insisted.

Andra collected some more cuttings into her backpack. "I wish I could smell them," she said wistfully. Pelt's skin filtered out all volatile organics. She aimed her laser pen to dig one out by the roots. The phycoid came up, but nearby stems sparked and smoldered.

"Watch out!" squeaked the eye-speaker.

She winced. "Don't deafen me; I'll put it out." She stamped the spot with her boots and sprinkled some water from her drinking jet. "This planet's a fire trap." The phycoid roots, she noted, were long twisted loops, tightly pressed together, but loops nonetheless. All the living structures seemed to be bagels squashed and stretched.

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"Great Spirit, we've got company," Skyhook exclaimed.

Andra looked up. She blinked her eyes. A herd of brown-striped truck tires were rolling slowly across the field. To get a closer look, she pressed through the phycoids, stopping every so often to extricate her feet from the looped foliage. She made about ten meters progress before stopping to catch her breath.

"No need to get too close," Skyhook reminded her. His eyes had telephoto.

"Yes, but I might pick up droppings, or some fallen hair or scales."

Some of the rolling "tires" were heading toward her. Each one had several round cranberry-colored spots set in its "tread." The "tread" was composed of suckers that stretched and extended to push in back, or pull in front. "They must be animal-like, 'zoöids,'" suggested Andra. "Those red things—could they be eyes?" She counted them, two, three, four in all, before the first came up again. Those eyes must be tough, not to mind getting squashed down.

"If these creatures are zoöids," Pelt wanted to know, "how do they feed?"

Skyhook said, "Their suckers ingest the phycoids."

Andra stopped again to pull out her foot. "They sure know how to travel," she wryly observed. "No wonder they never evolved legs." One four-eyed zoöid got excited, and took off with remarkable speed; then it suddenly reversed, heading backwards just as fast. These zoöids had no "backwards" or "forwards," she thought.

Quantum radioed again. "Andra, how are you holding up? Is your breathing OK?"

She took a deep breath. "I think so." Most of the rats had died from inhaling toxic dust. She resumed her attempt to make headway through the phycoids, and searched the ground for anything that looked like droppings. Overhead, she heard a strange whirring sound. A flock of little things were flying, their movements too fast for her to make out.

"Their wings are turning full around, like propellers," Skyhook exclaimed in amazement. "Why, *all* these creatures are built of wheels, one way or another."

"Sh," said Andra. "A zoöid is coming up close."

The creature rolled slowly over the phycoids, squashing the golden ringlets beneath it. Andra took a closer look. "There's a smaller ring structure, just sitting inside the bagel hole. I'll bet it's a baby zoöid." The clinging little one rolled over and over inside as its parent traveled. The parent did not seem to notice Andra at all; neither her shape nor her smell would resemble a native predatory, she guessed.

The radio crackled again. "We must attempt contact," Quantum reminded her. Any zoöid might be intelligent.

Andra held out her communicator, a box that sent out flashing lights and sound bursts in various mathematical patterns, strings of primes and various representations of pi and other constants. It even emitted puffs of volatile chemicals, to alert any chemosensing

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creature with a hint of intelligence. Not that she expected much; their probes had broadcast such information over the past year.

Then she saw it: A giant zoöid was approaching, five times taller than the others and perhaps a hundred times their weight. As it barreled along, picking up speed, the small striped ones took off, zigzagging crazily before it. The ground rumbled beneath her feet.

"Get back to my cabin!" urged Skyhook. "We'll all get run over."

"Wait," said Pelt. "Do you think it heard us? What if it wants to talk?"

"I don't think so," said Andra, prudently backing off. "I think the smaller zoöids attracted it, not us."

A small zoöid went down under the giant one, then another. That seemed to be the giant's strategy, to run down as many little ones as it could. At last it slowed and turned back, coming to rest upon one of the squashed carcasses.

"It's extending its suckers to feed," observed Skyhook. "Let's get back before it gets hungry again."

"I think that will be a while," said Andra. "It's got several prey to feed on." The rest of the smaller zoöids seemed to have calmed down, as if they knew the predator was satisfied and would not attack again soon. Definitely a herd mentality; no sign of higher intelligence here.

Andra resumed collecting phycoids and soil samples, recording the location of each. Deeper into the field, she saw something thrashing about in the phycoids. She made her way toward it through the tangle of looped foliage.

"It's a baby zoöid," she exclaimed. The poor little bagel must have fallen out when its parent ran off. Or perhaps the parent had expelled it, as a mother kangaroo sometimes did. At any rate, there it was, squirming and stretching its little suckers ineffectually, only tangling itself in the phycoids.

"Watch out; it might bite," said Skyhook.

"Nonsense. I have to collect it." Andra stuffed her hands into a pair of gloves, then approached warily. With one hand she held out an open collecting bag; with the other, she grabbed the little zoöid. It hung limply, twisting a bit.

Suddenly it squirted something. An orange spray landed on the phycoids, some of it reaching her leg. Andra frowned. She plunged the creature into her bag, which sealed itself tight. "Sorry about that, Pelt."

"You're the one who would have been sorry," Pelt replied. "That stuff is caustic, as strong as lye. No problem for me, but your skin would not have liked it."

"Thanks a lot. I guess we should head back now; I've got more than I can hold."

She turned back toward Skyhook, some hundred meters off, his spidery landing gear splayed out into the phycoids. Methodically she made her way back, with more difficulty now that she had so much to carry. She was sweating now, but Pelt handled it beautifully, keeping her skin cool and refreshed. The distant forest of tall blue phycoids sang in her ears. The

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Singing Planet, they could call it, she thought.

"Andra . . . something's not right," Pelt said suddenly.

"What is it?" She was having more trouble plowing through the foliage; her legs were getting stiff.

"Something that baby zoöid sprayed is blocking my nanoprocessors. Not the chemicals; I can screen out anything. I'm not sure what it is."

"What else could it be?"

Skyhook said, "Just get back to my cabin. We'll wash you down."

"I'm trying," said Andra, breathing hard. "My legs are so stiff." The shuttle craft stood hopefully ahead of her. Only about ten meters to go, she thought.

"It's not your legs," Pelt's voice said dully. "It's my nanoplast. I'm losing control over the lower part, where the spray hit. I can't flex at your joints any more."

Her scalp went cold, then hot again. "What about your air filter?"

"So far it's OK. The disruption has not reached your face yet."

"Just get back here," Skyhook urged again. "You're almost here." Obligingly the doorway appeared on the craft's surface, molding itself open in a rim of nanoplast.

"I'm trying, but my legs just won't bend." She pushed as hard as she could.

"Drop your backpack," Skyhook added.

"I won't give up my samples. How else will we learn what's going on here?" She fell onto her stomach and tried to drag herself through.

"It's microbes," Pelt exclaimed suddenly. "Some kind of microbes—they're cross-linking my processors."

"What? How?" she demanded. "Microbes infecting nanoplast—I've never heard of it."

"They messed up the probe before."

"Quantum?" called Andra. "What do you think?"

"It could be," the radio voice replied. "The nanoprocessors store data in organic polymers—which might be edible to a truly omnivorous microbe. There's always a first time."

"Microbes eating nanoplast!" Skyhook exclaimed. "What about other sentients? Are the microbes contagious?"

"You'll have to put us in isolation," said Andra.

"Andra," said Pelt, "the cross-linking is starting to disrupt my entire system." His voice came lower and fainter. "I don't know how long I can keep my filters open."

Andra stared desperately at the door of the shuttle, so near and yet so far. "Quantum, how long could I last breathing unfiltered air?"

"That's hard to say. An hour should be OK; we'll clean your lungs out later."

She tried to recall how long the first rat had lived. Half a day?

"I'm shutting down," Pelt warned her. "I'm sorry, Andra. . . ."

Skyhook said, "Pelt, you'll last longer in rest mode. We'll save you yet—there's got to be an antibiotic that will work. They've got DNA—we'll throw every DNA analogue we've got at them."

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The nanoplastic skin opened around Andra's mouth, shrinking back around her head and neck. An otherworldly scent filled her lungs, a taste of ginger and other unnameable things, as beautiful as the vision of golden ringlets. Planet Ginger, she thought, smelled as lovely as it looked. She was the first human to smell it; but would these breaths be her last?

Pelt's skin shriveled down her arms, getting stuck at her waist near the spot that got sprayed. She tried again to pull herself through the phycoids, grabbing their tough loops. Suddenly she had another idea. Pulling in her arms, she sank down and rolled herself over and over, just like the zoöids. This worked much better, for the phycoid foliage proved surprisingly elastic, bending easily beneath her and bouncing back again. Perhaps those zoöids were not quite so silly after all.

At the door, Skyhook had already extruded sheets of quarantine material to isolate her and protect its own nanoplast from whatever deadly infection Pelt harbored. The doorway extended and scooped her up into the chain.

As the doorway constricted, at last closing out the treacherous planet, Andra let out a quick sigh of relief. "Skyhook, we've got to save Pelt. Have you got anything to help him?"

Two long tendrils were already poking into the quarantine chamber, to probe the hapless skinsuit. "I'm spreading what antibiotics we have on board," said Skyhook, from the cabin speaker now. "Nucleotide analogues, anything likely to block DNA synthesis and stop the microbes growing. It's bizarre, treating a sentient for infection."

Andra carefully peeled off the remaining nanoplast, trying to keep as much of it together as possible, although she had no idea whether it was beyond repair. "Pelt," she whispered. "You did your best for me."

By the time they returned to the station, there was still no sign that any of the antibiotics had curbed the microbes. Quantum was puzzled. "I have a few more to try," she said, "but really, if the chromosomes are regular DNA, something should have worked."

"Maybe the microbes' DNA is shielded by proteins."

"That wouldn't help during replication, remember? The double helix has to open and unzip down the middle, to let the new nucleotides pair. There's no way around it."

Andra frowned. Something was missing; there was still something wrong, about the growing microbes with their three daughter cells. How could they unzip their DNA, fill in each complementary strand, and end up with three helixes? She thought she had figured it out before, but now it did not add up. She coughed once, then again harder. Her lungs were starting to react to the dust—she had to start treatment now.

"We've got some data on your samples," Quantum added. "The microbial cells concentrate acid inside, instead of excreting it, like most of our cells do. I still find only fifteen amino acids, but some of them—"

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"I've got it!" Andra leaped to her feet. "Don't you see? *The chromosome is a triple helix.* That's why each cell divides in three—each daughter strand synthesizes two complements, and you end up with three new triple helixes, one for each cell." A fit of coughing caught up with her.

"It could be," Quantum said slowly. "There are many ways to make a DNA triple helix. One found in human regulatory genes alternates A-T-T triplets with G-C-C."

"Then it has a two-letter code, not four." Double-helical DNA has four possible pairs, since A-T is distinguished from T-A; likewise G-C differs from C-G.

Quantum added, "The triple helix is most stable in acid, just what we found in these cells."

"Just hurry up and design some triplet analogues." Quantum's sentient brain could do this far faster than any human. "Triple helix," Andra repeated. "It would resist ultraviolet damage much better, with the planet's thin ozone layer. But how to encode proteins, with only two 'letters'?" The triple helix had only two possible triplets; its three-letter "words" could only specify eight amino acids to build protein. "Maybe it uses words of four letters. With two possible triplets at each position, that would encode two to the fourth power, that is, sixteen possible amino acids."

"Fifteen," corrected Quantum, "if one is a stop signal."

* * *

The next day, after an exhaustive medical workout, Andra felt as if a vacuum cleaner had gone through her lungs. Pelt still had a long way to recover, but at least the pesky microbes were cleaned out.

"It's hopeless," complained Skyhook's eyespeaker. "If even sentients aren't safe, we'll never explore that planet."

"Don't worry," said Quantum's voice above the holostage. "Pelt's nanoplast has an exceptionally high organic content. A slight redesign will eliminate the problem. Machines have that advantage."

Still, Pelt had nearly died, thought Andra.

"Your phycoid and zoöid samples all have toroid cells, too," Quantum added. "They have circular chromosomes, with no nuclear membranes: They're all prokaryotes. Just wait till the Free Fold hears about this," Quantum added excitedly. "I've got the perfect name for the planet."

Andra looked up. "Planet of the Bagels?"

"Planet Prokaryon."

Prokaryon—yes, thought Andra, it sounded just pompous enough that the Fold would buy it.

Still, she thought uneasily about those regular garden rows of phycoid forest and fields, with all kinds of creatures yet to be discovered. "I wonder," she mused. "Someone else just might have named it first." ■

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"TEXAS" IN MUNICH, PART 1: CLOSING IN ON THE CONSTANTS OF THE UNIVERSE

This year I am on sabbatical at the Max Planck Institute for Physics in Munich, Germany, which by a pleasant coincidence was also the site of the 17th Texas Symposium on Relativistic Astrophysics held here two weeks ago (December 12-15, 1994), which I attended. My contribution to the Symposium was a paper co-authored with fellow physicist/SF-writers Forward, Benford, and Landis, and leading wormhole theorists Visser and Morris on the gravitational lensing of natural wormholes (see my recent AV column on this in the Mid-December, '94 *Analog*).

The Symposium bears the "Texas" label because in 1962, after astrophysics had just been jolted to its roots by the discovery of quasars, a special meeting was held in Dallas, Texas to bring general relativity theorists together with astronomers and astrophysicists in an attempt to understand the startling new quasar phenomenon. Since then, the Texas Symposium has been held every two years in a variety of locations in and out of Texas. Munich was host to the most recent Texas Symposium because it has become a center of work in x-ray astrophysics, both theoretical and observational, as well as the home base of the European Southern Observatory. The Conference was held at a time when the Moon was waxing bright, because it is easier to get the attention of astronomers at such times.

The "relativistic" part of the conference title literally refers to phenomena that involve very high energy processes or collapsed states of matter: gamma, x-ray, and gravity wave astronomy, supernovae, neutron stars, jets from active galactic nuclei,

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quasars, black holes, and exotica like cosmic strings and wormholes. For the purposes of the Texas Symposium, however, the term has been generously expanded to include areas that are only marginally relativistic: radio astronomy, microwave background measurements, gravitational lensing, neutrino astronomy, deep exposure surveys of the Galaxy populations, and dark matter searches. The major topics covered by the 17th Texas Symposium therefore provide an excellent overview of the state of some of the most interesting areas of astrophysics. In this present column I will provide an overview of two of these areas, cosmology and gravity wave detection. In my next column (*Analog*, October '95) I will give an overview of another area covered in the Symposium: gamma ray bursts.

Observational Cosmology: Closing in on the Constants of the Universe

In the 1930s Albert Einstein expanded his fundamental theory of gravity (general relativity) into a formalism for theoretical cosmology that is able to treat whole universes as physical objects described by a few equations. Within these equations, the state and ultimate fate of a given universe are described by the values of a few parameters: H_0, Ω_0, Ω_B, t_0, and Λ. None of these quantities are particularly well determined at present. Many of them are expected to change as the Universe expands and changes, and in these cases the "0" subscript indicates their present-time value. Let me begin by explaining what they mean. The Hubble parameter H_0 has a present best value of about 66 ± 30 km/sec per megaparsec (1 megaparsec = 3,261,633 light-years) and describes the present expansion rate of the Universe. In other words, a galaxy 100 million parsecs away should be receding from us at a speed of about 6,600 km/second due to the expansion of the Universe.

The density parameter Ω_0 has a present best value between about 0.1 and 2 (theorists love $\Omega_0 = 1$) and describes the ratio of the actual present mass-density of the Universe to the "critical" mass density ρ_c that would exactly "close" the Universe (about 10^{-29} g/cm^3). The value of Ω_0 implies the ultimate fate of the Universe, whether it will expand forever ($\Omega_0 < 1$) at about the present rate, or stall in a parabolic expansion rate that diminishes asymptotically to zero ($\Omega_0 = 1$), or reverse its expansion ($\Omega_0 > 1$) and recontract to a Big Gnab singularity (the ultimate form of recycling) sometime in the future.

The baryon density parameter Ω_B has a present best value between about 0.01 and 0.2 and describes the fraction of Ω_0 that is provided by ordinary matter (galaxies, stars, planets, gas clouds, atoms, protons, electrons, etc). The well established fact that $\Omega_B < \Omega_0$ implies that most of the mass of the Universe, between 80% and 99%, is not in the form of ordinary matter. This is called the Dark Matter Problem.

The age of the Universe t_0 has a present best value of about $0.8 \pm 0.5 \times 10^{10}$ years. It is the elapsed time since the Big Bang. The present age t_0 is expected to be smaller than the

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"extrapolated age" given by $1/H_0$ (about 1.2×10^{10} years) because the Universe should have expanded rapidly at first and then decelerated under the pull of the gravitational mass it contains. Theorists would prefer for the product $H_0 \times t_0$ to be between about 0.9 and 0.7. Values less than $^2/_3$ or greater than 1 cause them severe problems.

The cosmological constant Λ, the mass-energy density of free space, was once described by Albert Einstein as "my biggest mistake." In formulating his original cosmology formalism, he discovered that the universes emerging from his formalism were dynamically unstable and underwent rapid expansion or collapse. They were therefore inconsistent with the pre-Hubble "steady-state universe" orthodoxy of the time. In desperation, Einstein was driven to give free space itself an energy density Λ. This produced steady-state solutions to his equations. After the expansion of the Universe was discovered by Hubble, Einstein considered this introduction of an "unneeded" constant an embarrassment.

Today the cosmological constant Λ continues to be an embarrassment to cosmologists, but for other reasons. The present value of Λ is not well constrained by data. Λ and the mass energy of space it describes could be negative. Alternatively, a large fraction of the mass-energy of the Universe could be tied up in the energy of space itself.

Cosmological theorists, like Einstein, would like to have $\Lambda=0$ so that it could be dropped as a parameter, but all of their attempts to predict its value from standard field theories or from emerging theories of quantum gravity have led to Λ values that are either infinite or exceed by a factor of 10^{120}, the largest Λ value allowed by observations. No theory gives a value small enough to be consistent with the data. This is a major unsolved problem of modern cosmology.

There are also experimental hints that Λ may not be zero. Using the Casimir effect (see recent AV columns in *Analog* Mid-December '90 and February '95), laboratory experiments have successfully removed energy from the volume of space between a pair of parallel conducting plates, giving that volume an energy density less than that of empty space. It is unclear whether the alternative of a negative energy density or of a non-zero baseline free space energy density ($\Lambda>0$) is more palatable in accommodating this result.

Much of the theoretical and observational work presented at the 17th Texas Symposium on Relativistic Astrophysics was related to the values of these parameters. Uncertainties in the constants of the Universe were being trimmed down from many directions. Wendy Freeman described a program that is using the Hubble Space Telescope to gather data on variable Cepheid stars in distant galaxies to determine H_0 to $\pm$ 10% accuracy. The present preliminary results of her collaboration give a value of the Hubble parameter of $H_0 = 80 \pm 17$ km/sec/megaparsec. Theorist Mike

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Turner, in a later talk, pointed out that $H_0 > 85 \pm 7$ km/sec/megaparsec forces a non-zero cosmological constant ($\Lambda > 0$), and that Freedman's new value is perilously close to this range.

Perhaps the worst nightmare of students is to oversleep on the morning of a big exam. The corresponding nightmare of scientists is to oversleep due to jet lag on the morning of an important address at a conference. At the 17th Texas Symposium this happened to David Wilkinson, who was presenting the latest results from the Cosmic Background Explorer (COBE). His talk was delayed, but fascinating.

The cosmic microwave background was produced about 100,000 years after the initial Big Bang, when the Universe emerged from its plasma phase and protons combined with electrons to form a hot but electrically neutral medium. The photons from this event that reach us today have been Doppler shifted downward in frequency by a factor of 1000 and transformed from infrared light to microwaves. They constitute the majority of photons in the Universe and form a "microwave radiation bath" through which, according to COBE data, the Solar System moves with a velocity of 369.5 km/s or 0.123% of the velocity of light.

The microwave background in a 7 degree angular region of sky has been found by COBE to fluctuate in the intensity by a few parts in 10^6 (the so-called "Face of God" in the initial COBE press reports). The size of these fluctuations has placed tight constraints on cosmological models (and eliminated some of them). So far, the COBE results are consistent with the standard Big Bang model and the inflation scenario. For example, COBE shows a fluctuation power exponent of 1.11 ± 0.60 while inflation predicts 1.00.

Perhaps the most exciting part of Wilkinson's talk, however, were the fluctuations of the microwave background that COBE did not observe because of angular resolution. New calculations predict a "ringing" in the decoupling of the microwave background from the medium that produced it, a definitive wiggle pattern in the measurements that should be observable at angular scales of less than 2 degrees. The information content of the predicted wiggles is very rich, and would permit unambiguous extraction of H_0, Ω_0, and Ω_B to an accuracy that would depend primarily on the quality of the measurements. Many groups are now attempting these measurements from mountain tops and balloons, but what is clearly needed is a new satellite measurement to perform COBE type measurements with better angular resolution. The European Space Agency satellite COBRA/SAMBAS will be launched soon, and is designed to do this.

At the 17th Texas Symposium the fundamental parameters of our Universe are still uncertain to about a factor of 2. I suspect that by the time of the 18th Texas Symposium, in December, 1996 in Chicago, these will have been measured by overlapping methods to an accuracy of 10% or better. And I am betting that the cosmological constant turns out to be

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greater than zero.

Gravity Wave Detectors

Gravity waves are propagating disturbances in space itself. Distances grow slightly longer or shorter under the influence of gravity waves. They are produced by rapid movements of massive objects, e.g., black holes or neutron stars in decaying binary orbits.

So far, gravity waves have been detected only indirectly by observing the spin-down rate of binary pulsars as the system loses energy due to gravity wave emission. However, direct detection should be coming soon. LIGO, the long baseline gravity wave interferometer, a new facility funded by the US National Science Foundation for the direct detection of gravity waves is under construction at sites in Washington State and in Louisiana. At each LIGO site there will be a right-angle pair of 2 km long multipass laser interferometer arms. The detectors are sensitive to nucleus-diameter-scale changes in spatial length, as indicated by shifts in the laser interference pattern as incoming gravity waves alter the lengths of the detector arms. It is expected that LIGO will produce the first direct detection of gravity waves and will open a new window on the Universe, creating the new field of gravity-wave astronomy.

At the 17th Texas Symposium on Relativistic Astrophysics, Kip Thorne gave an overview of the new detectors that will be coming on line after LIGO. There are two more ground-based gravity wave detectors: VIRGO, a 3 km interferometer to be located at Pisa, Italy, and GEO, a 0.6 km interferometer to be located at Hannover, Germany.

On the longer time scale, space-based gravity detectors are now being planned. LISA is an ensemble of six laser interferometer modules to be funded by the European Space Agency and boosted into a solar orbit 20^0 behind that of the Earth by an Ariane 5 launcher, perhaps in 2015, with technical studies beginning this year. A somewhat more modest NASA/JPL project, SAGITTARIUS, would place a similar set of interferometer modules in a near-Earth orbit. Both of these space-based detectors, because of their much greater interferometer lengths and their isolation from Earth-based vibration, would be far more sensitive than their Earth-bound counterparts and will have a much better overlap with theoretical predictions of gravity wave producing astrophysical events.

A new window is opening on the Universe, and we can expect to see some strange, puzzling, and interesting sights. ■

Whether he likes it or not, man is the instrument of nature; it forces on him its character and appearance.

—Pablo Picasso

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Kent Patterson

CRADLE AND ALL

One thing an explorer must have is adaptability.

Illustration by Steve Cavallo

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Rock-a-bye-baby time and this weird planet sure as hell grew some mean tree tops. Orem Paige stood on the edge of the Amaterasu Arboreal Region Exploratory Habitat and peered at the jungle below. Called the "cradle" by everyone in it, the habitat looked like a bright orange air mattress some hundred meters square. On top, it had a transparent dome which served as a control and communications center. Beneath that, the "canvas condo" held research labs and living quarters. Inflated to slightly higher than atmospheric pressure, the cradle rode on top of the jungle canopy like a rubber raft rides on the ocean, its weight distributed so widely that the trees hardly bowed beneath.

To the west, Orem could see nothing but tree tops, undulating in the wind like a gray-green surf, a smudge on the far horizon all he could see of the distant mountains. They named the planet Amaterasu after the Japanese sun goddess. Appropriate, at least for this part. Very hot.

The trees shimmered in the rainbow of sunlight reflecting in the superfine mesh net which protected the cradle. The net kept all the alien creepy crawlies outside—especially needle bugs.

To the east, he could see low black clouds reminding him that the great granddaddy of all hurricanes was working up strength to strike. The cradle would rock, all right, and down would come baby, cradle and all. Unless Orem stopped it.

"You ready, or are you contemplating applying for a desk job?" Suzanne "Suze" Harrin said, walking up from behind. He could feel her footsteps rippling the cradle fabric.

Orem turned around. Like everyone in the cradle, Suze wore a bio-isolation suit with its own air supply, her name printed in large letters on her left breast. Her suit was orange on the left side, white on the right, his the reverse. No one knew why. Through her transparent mask, she made a quick air kiss. He glanced around to see if anyone was looking, then returned the kiss. They'd been bunk mates for three months now, and were still a little silly.

"OK. Time for me to make like a monkey."

"They don't use monkeys for off-world work," she said. "Endangered species and all. Too valuable."

"No monkeys here anyway. I miss them. And the birds. When I trained back in the Amazon Park, the jungle was thick with birds. You couldn't hear yourself speak for the squawking." A drop of sweat stung his eye. He couldn't wipe his brow because of the mask. This jungle was like a steam chest, worse than the Amazon, though nothing up here to what it must be on the ground below.

"Well, give this place a billion years and twice as much oxygen, there'll be birds."

"Long time to wait."

"Good Mormons are supposed to be patient."

"I'm not a Mormon. OK, so my parents are, but it's not hereditary."

"I think it's cute they named you for your home town."

"Could have been worse. Could

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have been Moroni."

Orem reached down, picked up his limb climber robos and hung them from his belt. They looked like spiders, long legs with bodies the size of a fist. With the robos in place, he bent over to pick up a roll of carbon fiber cable.

"Permission to exit the nets?" Going outside the nets without a buddy watching from inside was absolutely tabu.

"Granted."

Orem unfastened the exit, climbed through the net, then turned to catch more rolls of cable as Suze handed them out. Now he perched on the edge of the cradle, the fabric sinking under his feet like a soft mattress. Cables ran everywhere, holding the cradle in place. He'd put most of them in, and hadn't enjoyed the job. But if the satellite pictures didn't lie, the coming storm made the average Earth hurricane look like a summer breeze. The cradle needed all the reinforcements it could get.

He looked down. Some trees had leaves as big as bath towels, long tough rubbery things which felt like plastic. Others had narrow leaves, or long whip-shaped ones. The biologists hadn't had time to sort out the species. Near the ground, the trunks bulged like beer bottles. On a tree in Utah a bulge like that would have indicated a disease. African baobab trees bulged too, so fat trees weren't too odd. What was odd was that here all the jungle species bulged. Orem couldn't see the ground, a morass of mud and rot that never saw the sun.

Just as well he couldn't see it. Or smell it. The cradle rocked in the wind, the cables vibrating like guitar strings. Holding one cable in his hands, cautiously he stepped out on another, edging his way down to where the leaves thinned out and the tree trunks grew thick.

"Watch for needle bugs!" Suze shouted.

Sure, tell the man on the flying trapeze to watch for rattlesnakes. Orem glanced around, eyeing the leaves. Bugs everywhere. The biologists went nuts trying to classify them. Whole armies of little ones made brown splotches on the leaves. Bigger ones ate the little ones. One had an orange spot on its back. Or maybe its head, Orem wasn't sure. One species burrowed deep into leaves and ate out the insides, leaving just the outer transparent skin like windows on a bus.

A branch glittered wet in the sun. Orem examined the edges of the wet spot carefully. Finally he spotted a spit toad pretending to be a large wart on the tree bark. Spit toads spat out the sticky lining of their stomach, waited for some poor stupid bug to get caught, then flipped the stomach back in again. Harmless, but disgusting. Anyway, no needle bugs. Looking for a gray-green bug on gray-green leaves was like looking for a black cat in a coal bin, and he had work to do.

He selected a tree a good five meters thick. Attaching a cable lead to one of the robos, he sent the robo scurrying about the trunk and back, then locked the cable in a solid loop. One down.

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* * *

After you stopped thinking about needle bugs, the heat, the storm coming, and how high above the ground you were, the job wasn't bad. Orem placed five more cables, returned for five more, and placed four.

The wind sighed around him. Leaves rippled about his face. Sunlight flickered over his orange and white suit.

"Orem! Freeze!" Suze shouted. Shocked, Orem froze. He felt the cables tremble as Suze ran up behind him.

So what was going on? He would like to look around, but didn't move. Slowly he saw the claw end of Suze's collecting stick glide past his face.

Something scurried in the leaves. The collecting stick shot after it.

"Got it!" Suze said. "Needle bug." She waved the creature in front of his face. About half as long as his hand, the needle bug had a segmented body and six legs. Each leg ended in a round sticky cup, just the thing for clinging to plastic trees or anything else unlucky enough to come within its grasp. Unlike Earth insects, the needle bug's middle section bristled with long hairs to help it breathe in the oxygen poor atmosphere. It had no face, not even a mouth, just two eye spots and a thin needle between them.

The bug writhed angrily, trying to escape. Suddenly the needle jumped forward, shooting a drop of venom half a meter into the air.

"Orem, I told you to be careful. Losing her bunkmate could give a woman a bad reputation."

"Thanks, I guess. I don't understand how you see those damned things. Trained biologist's eye, I suppose. Anyway, there's one more cable. You'd better get behind the net."

Suze left, leaving Orem to place the next cable.

The wind worsened. Huge leaves threshed up and down, popping like flags. This cable had to be placed both lower and farther out. He had to climb limb to limb monkey-fashion, cursing and dragging the cable.

At last he found his tree, got the cable looped around, and started back. The wind pushed against him, slapping him with leaves and branches. Cables vibrated, threatening to throw him off every second.

Grateful to be finished, he reached over the last limb.

Pain exploded in his hand, so intense his stomach closed like a fist.

Needle bug! Frantically he beat his hand against the limb, then grabbed at the bug with his other hand. It clung fast, a small green lump hurting him worse than anything had ever hurt him before. He was slipping over the edge of consciousness.

Suze grabbed his fingers, directing the flame of a small torch directly on the bug. It swelled, popped like a corn kernel, blackened, and burned. Then more hands tugged him through the net. Someone hit Orem with a sedative gun, and he went to sleep.

"Wakey wakey time," he heard a sing-song voice. He opened his eyes, felt the room move around him, then closed them again.

Hell. The room really was moving.

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In a strong wind, the "canvas condo" became very lively. He opened his eyes to see Mara Garcia's face. She served as combination commander, researcher, and med tech. Dark eyes, black hair, mouth drawn tight as if something smelled bad.

"Sorry to push you, but we're in a storm, and need all hands on deck. You're our only engineer."

"My hand's not much good."

"Hey, we saved you. You thank the lab techs for this new stuff. It made a miracle. You'll be good as new in ten minutes. And stop looking for Suze. I sent her off to work."

"God. I thought I was dying."

"Only lucky you picked on a baby bug. Needle didn't penetrate that well and your suit took most of the poison. Bigger bug might be a problem."

"This wasn't a problem? What's in that needle, anyway?"

"Not totally analyzed, but a biological solvent, we think. The bug hangs on till the meat dissolves, then sucks up the goop with the same needle, sort of like some spiders. Clever if you haven't invented teeth. Of course, it didn't figure on something as big as you. That needle would be very effective against something small."

"It's effective. Take my word for it."

"Oh, you just got a touch. The bug was an immature male—if there is any other kind of male." She paused at the time-honored joke, then continued. "Actually, all our specimens are male. I wonder where the females are. Or is this planet even weirder than I thought?"

"It's weird enough."

"Yeah. Well, Suze has played poor suffering martyr for an hour." Mara paged Suze on the comm. "Keep it short. You've both got work, and I can't handle the mushy stuff—I just had lunch." Orem stood up, nearly fell, thanked the doc for her uncharming bedside manner, then walked down the fabric hallway with as much dignity as any walker can when the hallway is swaying like a drunk on a unicycle.

"Orem!"

"Hi, Suze. I'm still alive."

The "waiting room" contained two inflatable chairs, a coffee dispenser, and a vid screen. The walls puffed as if they were panting.

"Oh, give me a hug and stop being an idiot."

He did that. Hugging a bio-isolation suit had all the sexual charge of hugging a laundry bag, but it was comforting. For a few moments they talked of nothing. Orem wished they could go back to the bunk, seal themselves in, and get out of the miserable suits. He wanted to feel her next to him, if only to convince himself she was real and he was still alive. He wanted to get to know her better, find out how it had been for her growing up in Europe. He'd been raised under a round blue Utah sky, with white-capped mountains looming over sage brush and sandstone stretching so far the eye got tired of looking and quit.

Orem's emergency station was the comm room in the dome. Double doors at each end held in the air pressure. The transparent dome gave a 360 degree view of the surrounding area. Too good a view. The sky looked

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green, the trees outside threshed and swayed, and the whole room rolled like a ship on the high seas. On the right side, a row of vivid screens showed information coming in from other stations and from the mother ship orbiting overhead, "upstairs" in spacer jargon. The left side held a couple of canvas benches and a big screen vid with a chip library. Only braggarts called it the "lounge."

Two people, Jason and Elaina, sat at computer screens. Both turned when Orem entered. "Been sleeping one off, Orem?"

"You know these new bunkmates."

Orem bowed and went to work.

Asair, an Indonesian woman who served as chief engineer upstairs, came up on screen.

"Heard you had a tough experience, Orem."

"A bit. Learned not to put my hand in places I haven't looked. I'm OK now."

"Good. How's the cradle holding?"

Orem checked the readouts on his strain gauges. "No pain yet."

"Yeah. But from up here, we see gusts to 300 klicks peaking in less than an hour. You want an air rescue, speak now. We've got some major AMWIWs, and we're down to only two working shuttles, at least for a week."

AMWIWs meant "A Miracle When It Works," some sarcastic engineer's name for high-tech wonders which didn't. Technical glitches were the curse of space exploration. Only two shuttles working was rotten luck, especially with four other habitats in different ecological areas of the planet.

"Check the big honchos for a decision, but I don't think the cradle will have a problem. I set enough cable to tie up half the forest."

"Max good. I'll ask the boss."

Orem returned to his work, checking and rechecking the strain gauges for signs of weakness. On a platform below the cradle, a small reactor powered the station and oxygen extractor. Amaterasu's atmosphere had low oxygen, high carbon dioxide. Native plants thrived, but a human would slowly suffocate.

Everything tested A-OK. Soon word came: the cradle rides this one. Orem was happy. Two shuttles could take the cradle, but not the reactor. Hooking everything up again would be a major pain.

Orem saw the hurricane coming, a wave rolling over the trees, darkening the sky with flying broken limbs and leaves. The sun vanished. Wet leaves plastered the transparent panels, blocking the view. Orem's chair bucked under him, thrusting his face into the console while the seat belt jerked at his waist, then instantly reversing and smacking his bottom back into the chair.

The screaming of the wind drove needles into his ears; the computer's voice recognition went berserk. Orem gripped his desk with his left hand to push the mouse with his right. The desk jerked out of his grip and the mouse went flying. Damn! He caught the mouse, twirling the ball with his thumb to command the motors controlling the strain on each cable. In the wind, he couldn't even

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hear the motors, but bit by bit they pulled the cradle nose down, making the wind push it into the trees rather than pulling it up. He turned, astonished to see one of his companions bouncing like hot bacon on the floor and the other—must be Elaina—riding her chair like a cowboy rides a bronco. She shouted something, but he couldn't hear.

Wind 340 and rising. Weather forecasters on Amaterasu had lots to learn. The fabric walls popped with a machine gun rattle. Could anything stand this buffeting? How could those damned trees stand it? But his cables held. Relax and ride. It's something to tell the guys from the other habitats when they got back together.

Needle bugs. Bugs as big as rats banging on the windows, bugs riding on glassy wings. No flapping, so they were gliders rather than fliers, hopping from tree to tree, ripping along in the wind at airplane speeds.

Orem remembered all the local bugs were males. The flyers must be females, riding the storm like a California zillionaire on an autowing. Storms brought in the girls. Christ. Millions of square klicks on this damned planet and they had to choose a needle bug love-in.

A wind blast tried to roll the cradle up like a blanket. Two strain gauges red-lined. The motors ran red-hot, so he turned them off and locked the cables in place.

"Orem? How's it going?" Asair, on the vid.

"I could use a cool brew."

"Sorry we goofed on the weather report. We just don't have all the reporting stations they have on Earth."

"Now you tell me. But basically, we're all cool."

It took a hell of a lot to break a carbon fiber cable, and those huge trees weren't going anywhere.

Whoom, whoom, whoom, giant footsteps drowned out the wind. Frantically Orem looked for a clear space in the muck covering the window.

The trees were falling! Long rows fell down before the wind.

No, not falling. Bending. Suddenly Orem realized how these trees survived.

"Hang on," he shouted. "We're going over. Those damned trees have knees!"

How could anyone guess that that big bulge at the base was a hinge?

With a rending crash, the cradle fell. Someone screamed, then smashed into Orem, jerking him viciously against his seat belt. A jolt of pain seared his stomach; he felt cut in two. Now the floor reared up, leaving him hanging like a fly on the wall. The chair popped loose, then Orem, chair and all, fell down the floor, his fingernails scratching at the fabric, trying to get a grip, then smashing head first into someone at the bottom wall.

"Sorry," he said, mumbling with his face pressed into someone's stomach and his butt, still in the chair, pointing straight up.

The lights went out.

Loosened, the wall fabric whipped Orem's side, slapping his arms and ribs. He snapped his seat belt, released himself from the chair and stood, only to have the wall flip and

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throw him down.

Alarms wailed.

"Air-tight security ruptured!" said a booming electronic voice. "Air-tight security ruptured."

A tear in the dome. Things couldn't get worse.

"Needle bugs!" A scream, with the pain of all mankind in it.

Orem leaped up, struggling to stand on the heaving mass beneath his feet. Torn fabric slashed across one eye, cutting his forehead and nearly blinding him with blood. He covered his face with his hands, the wind-driven fabric whipping his fingers, and forced his way to the back of the room where the emergency lights, armored suits, and first-aid kits were stored.

For a few seconds he pawed at the door, totally confused, for it was sideways. Finally his fingers found the release.

Lights. He flipped on a battery spotlight.

The place looked as if it had been stirred like cake batter. The walls flapped so loudly Orem couldn't hear the man—Jason, he thought, though his face was so contorted who could tell—screaming, though he could see his open mouth and his throat muscles straining as he struggled to pull a needle bug from his leg.

Shuddering, Orem wanted to help, but remembered the spacer's first law—protect the rescuer first. With trembling hands, watching where every finger went, he pulled an armored environmental suit from the emergency locker, climbed into it, grabbed a hand torch, and forced his way between the flapping fabric walls to Jason.

He flamed the needle bug. It didn't release until it turned to smoke.

A hand tapped his shoulder. He turned to see Mara. Like him, she wore full armor.

"My job," she shouted, pointing to Jason. "Your job: restore power and send out a mayday."

The next two hours came closer to describing hell than any sermon Orem had ever heard. Needle bugs everywhere. Orem got a mayday off using a battery-powered transmitter. The main power lines to the reactor were down. Orem used the robos to run an emergency lead. Carrying their cables, the robos scurried over the downed trees. Needle bugs jumped them again and again; proving IQ-wise, needle bugs weren't at the top of the class, but blind instinct's not to be despised. Orem shuddered.

The lights came back on.

Now, stabilize the cradle. With the motors working, Orem reeled in enough cable to pull the cradle right side up. As the fabric pulled taut, the wind had less of a target, and the terrible buffeting slowed. Others mended the breaks in the airtight fabrics, reinflating everything.

This done, Orem went to the sick bay to find Mara.

In the dimness of the emergency lights, Orem saw five bodies on canvas cots. Five out of twelve. He stooped nearer.

Suze! Her eyes stared at the ceiling, her face waxen in the dim light.

"Oh, please, don't let it be true."

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He touched her hand with his armored glove. She didn't move. Only her chest heaved, sucking oxygen from a clear plastic tube. "Don't die, Suze," he murmured, bending to look closer at her face.

Whack! Something slammed into his armored back. Mara. She'd hit him.

"No, dammit, no!" she shouted. "No time for whimpering. Get topside. They're sending the shuttles for us."

"What? In this wind?"

"We have five people in critical condition. Just enough serum to last maybe two hours. We need more serum now, and we need the sick bay on the big ship. You guide them down. Save the people."

"We can't take anyone not in armor outside. They'll be bug meat in seconds."

"Don't tell me what I've got to do. You do what you've got to do."

Orem ran topside just in time for the two shuttles swooping overhead.

"So what's happening down there?"

Orem recognized the pilots by voice, Ivan Diachev and Riena Eisner. Then he glanced out, glimpsed the shuttles, and felt like screaming. They had no pods attached. The shuttles were simply generic carriers, a tiny pilot's compartment, engines, and monster fuel tanks. For short trips in the planet's atmosphere, they carried freight in slings. To reach orbit with passengers, they needed a special pressurized passenger pod.

"Where in hell is the pressure pod?" Orem shouted.

"Sitting in the desert halfway around the world from you. Rough landing, cracked an attachment point."

"Then what are you planning to do? We have five casualties. We need help now."

"We have serum for you right now. Then we're trying for a pickup of the entire cradle, minus the reactor. We'll carry you to a mountain habitat out of the storm and the needle bugs. They've got a better medical setup than you."

"Pick up the cradle? That's a tall order in this wind."

"No choice, unless you can wait."

"OK, but it's going to be a bumpy ride."

Orem watched the shuttles head into the wind, one on each side of the cradle. From time to time, Orem corrected them—the automatic laser guidance system was DOA. Mostly they worked by themselves, chattering back and forth and edging in, as they say, like whales making love. Long cables lowered, each with a robo clinging to the end, and whipping out into the wind.

Nothing to do but come lower, lower, and still lower. Now they hovered thirty meters overhead, heaving and rolling in the wind. Rocket blasts threw dancing shadows over thousands of trees, roots still firmly in the ground, but flat on their sides in ranks like sleeping soldiers.

Connection! The first robo caught a strong point and locked one cable in place, then went to lock in a second. That done, it came creeping up to the dome, cheating the wind by

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crawling low on its belly like an embarrassed dog. The robo bore a precious gift of serum, enough to save lives at least for a time.

Second connection. Another robo, more cables, more serum.

"You guys ready to ride?" Ivan said. "Hang on to your false teeth."

Orem called a "now hear this" over the intercom to warn sick bay, then ordered the pilots to pull them up.

Rocket blasts drowned even the wind. Slowly the shuttles climbed, pulling the two cables taut. Gradually Orem paid out the anchor cables below, keeping the cradle level.

"Before I drop my anchors, you shorten your leads, or this thing will buck us to death. It's the biggest sail you ever saw," Orem said.

The pilots agreed. Slowly the two ships reeled in cable, pulling themselves closer to the cradle and each other.

Wind shook the cradle. The cables hummed. So far, so good, Orem thought.

Suddenly Ivan's shuttle swung sideways. Ivan shouted over the comm. "Malfunction! Riena, blast west. Thruster failure, thruster failure."

Horrified, Orem watched helplessly as Ivan's ship rolled over and smashed into Riena's. Flame burst into the air, then streamed back in the wind. The ships crashed into the ground not a hundred meters from the cradle.

Ivan screamed, then Riena. Orem's stomach turned, the taste of copper in his mouth. The screaming went on until he turned the comm volume off.

* * *

That night Jason died. Mara stabilized the others by large injections of serum and the last-ditch idea of deep-freezing the bodies. Orem reprogrammed the oxygenator to produce dry ice. Carbon dioxide was one thing Amaterasu had plenty of. Suze stopped breathing, her life dangling from a few wires and a plastic tube half the size of a drinking straw.

At last the wind dropped.

When the sun came out, needle bugs covered the dome. Hundreds hopped and crawled, sometimes in twos and threes, sometimes in hundreds, over the huge trees lying flat on the ground.

Orem guessed the female bugs captured the males, mated, then left the dead males as food for their maggots, or whatever needle bugs had. Other animals either left or became bug fodder. No doubt the expedition had managed to settle right in the middle of the mating grounds. Orem hoped the trees would soon right themselves, but none of them did. Hell, who knew? Maybe they hibernated in bug season.

Orem watched the bugs crawl on the transparent dome, their sucker feet leaving tiny damp circles. They had to get off the damned ground. Sooner or later the bugs would break through the cradle fabric. His temporary lash-up of a power line had already lived longer than he expected; without power they hadn't a hope. Not that it made much difference if Suze died.

Suze. He remembered her just the other night—god, was it really just

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three days ago?—sitting naked on the edge of the bunk, the overhead lamp gleaming red on her brown hair, her fingers running over his bare chest. She laughed at how his chest hair curled around her little finger, calling him "Teddy Bear."

Now Suze slept in a cocoon of white plastic foam with the dry ice misting her face plate.

Next week, they'd have help. The other shuttles and the pressure pod should be fixed. One of the four other habitats might come in overland, though they were equipped for mountains or desert, not jungle. Too slow. They needed something which could fly. What did they have?

The dipper could fly. A robot winged rocket, it dipped down into the atmosphere and oceans to gather air and water which the orbiting solar panels upstairs converted to hydrogen and oxygen, shuttle fuel.

Could he convert the dipper to a rescue craft? It could take twelve passengers, but hardly the cradle. It couldn't hover, and had no landing gear. No hope. So they'd have to wait a week for a shuttle. Yeah. In another week, Suze will be dead. All four of them will be dead, his friends and shipmates. He needed to do something now, not next week.

The mistake they'd made from the beginning was thinking that since Amaterasu was like Earth in most things, it was like Earth in everything. Who'd have thought that trees would lie down, or that the needle bugs would take to the air? Amaterasu was not conventional.

He was conventional, too damned much so. He'd prepared for the wrong emergencies. Conventional thinking would kill him, and Suze, and Mara, and everyone. Now he had to break out of conventional thinking because nothing conventional would save them.

What was he overlooking? What resource did he have?

He glanced out of the transparent panels. The two shuttles had crumpled into a hopeless mass of wreckage. He could see their enormous fuel tanks through the shattered hull. Good thing those didn't blow.

Automatically his mind registered that there was enough oxygen there for months. Hydrogen too. Maybe he could make a torch and burn out the damned bugs.

Hydrogen. Unbidden, a picture from a history vid came into his mind, the *Graf Zeppelin,* an enormous airship, a sky whale cruising over continents and oceans at a time when the average airplane could barely cross a state.

A great idea. But he would have to do a hell of a lot of work.

"You're going to pump the entire cradle full of carbon dioxide?" Mara said. Her armored suit made her look enormous, buggy, like everything else on Amaterasu. Behind her, Orem could see four cocoons lying on metal shelves. One was Suze. "Why, may I ask?"

"To force out all the oxygen," Orem said. "Carbon dioxide's heavier. It will push the air out through the top of the dome. Then I'll seal the dome, and

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pump in hydrogen, which is lighter, and it will push the carbon dioxide down out the bottom. Presto. We have the cradle full of pure hydrogen. No oxygen, no explosions. Trust me."

"So you think we will fly?"

"We'll float, like a balloon. I've done the calculations. Then the dipper's going to come down and pick us up. Upstairs are already working on the reprogramming and modifications.

"So how do we transfer from here to the dipper?"

"That's tricky."

She sighed. "What's Plan B?"

"We stay here and become nutrient for baby needle bugs."

For the next few hours, the surviving crew worked as if their lives depended on it, which they did. With a great whooshing rush, the cradle filled with carbon dioxide, the air whistling out a hole in the dome. Standing at the hole, Orem monitored the flow, torch in hand in case of needle bugs.

Hearing a sudden scurrying, he turned. Needle bug, on the floor behind him, flipping over and over. He aimed the torch, then paused. What was the matter with it? Oh, obviously. Suffocating. Not even needle bugs could breath pure carbon dioxide. He torched it. Another, legs twitching, dropped from the ceiling. He torched it. They were everywhere, and he thought they'd all been driven outside. At least suffocating bugs didn't sneak up on you, and as the expanding carbon dioxide chilled the fabric, the bugs on the outside dropped off. An unexpected bonus.

By afternoon, hydrogen had replaced the carbon dioxide. The cradle bulged upward like a mattress thrown over a barrel, tugging at the restraining cables with enough lift to spare. The balloon idea worked. But the midair transfer—he didn't want to think about it.

"OK, upstairs. Launch the dipper. We're coming up."

"Got you. But about this midair thing. We're wondering. We see favorable winds for maybe two days. Once in the air, you could drift towards the mountains. No needle bugs there. In about five days, we could pick you up with a shuttle."

"Yes, and we'd have four people dead." Orem's mouth felt dry. "Mara says their condition is growing worse. Besides, the cradle is air-tight, but not hydrogen-tight. I doubt we'll have that much time in the air. We've talked it over. We'll risk the transfer. Besides, we've heard your weather predictions before."

"OK. Good luck."

Orem flipped on the intercom to warn Mara. "All full go up here."

"Full go down here."

"OK, hang on." What was it they had said in the old *Graf Zeppelin* movie? "Up ship!"

Orem hit the controls to drop the restraining cables. The ground fell away. Strange. He felt little sense of movement. Things just got small. In minutes the leaning trees looked no bigger than his fingers, and soon they became an undifferentiated mass of grey green. Rivers gleamed like silver ribbons against the dark mass.

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When the climb slowed, Orem turned on a guidance beam for the dipper, stuck a mini comm on his armor suit, then joined the others in the very bottom of the cradle. Packed in insulating foam, the four cocoons were held together by a metal frame. They looked almost festive with ten-meter long strips of white and orange fabric tied around their necks, waists, and feet. The rest of the crew, all in armor, had gathered every bit of equipment, supplies, and furniture they could tear loose from the cradle into one great junkpile.

"You guys ready?" Orem asked over the comm.

"As much as we'll ever be," Mara said. The others gave him a thumbs-up. In their armor, they looked more like machines than humans. Orem wished he could see their faces, shake their hands, exchange hugs.

Better just think about the transfer.

Orem opened a hatch on the bottom of the cradle. Far below, he could see the heavy reactor swinging from its long cable. Perfect ballast. On the mini-comm, Orem checked the mother ship for the position of the dipper. All full go.

"Orem, we've got you on radar. You're climbing too slow."

Orem looked down at the ground. They needed 4,000 meters for the midair transfer, and 5,000 would be better.

They weren't getting it.

"Everybody! Lighten ship. Throw everything out. I mean everything."

Working bucket brigade fashion, they dumped the junk, leaving a long trail of garbage behind. Just like tourists.

The cradle climbed faster.

"OK, this is, I think, it." Orem said to the cradle team. "We want as much altitude as possible. The hydrogen lift will take us so far, but if we climb fast, the momentum we gain will carry us higher. We'll meet the dipper at the top of the curve. Questions?"

For a few seconds, no one said anything. Then Mara spoke. "OK for that. Let's have no sentimental slobbering. Orem, what's next?"

"We tie on our superman capes."

Quickly all seven crew members tied on long orange and white ribbons.

"Orem, you're slowing. You need another 2,000 meters," said upstairs.

Orem cursed under his breath. The cradle leaked like a sieve. He'd underestimated the storm damage. Stupid, stupid, stupid.

"Everyone hang on. I'm dropping the reactor."

"Orem," Mara said. "We need power to keep the patients cold and to recycle our oxygen. You've dropped our supplies already, but we could still drift out of the bug area. If you drop the reactor, you're committing us to the midair transfer. No choice."

Orem's mind whirled. Mara was asking, not telling. He had to choose.

Far below through the open hatch, he could see thin wisps of clouds and below them, the jungle floor. He took a deep breath, held it to calm his nerves, then let it out.

Clear your mind. Above all, don't think about red highlights in brown hair, smooth skin, fingers tracing a

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line across your chest. Maybe they could drift and land in a river, float until the shuttles came. Did he have a right to risk seven healthy lives to save four dying ones? Maybe . . . No. No more maybes.

"Hang on, all!" He pushed button one on the mini comm, signaling the dipper upstairs. Then he pressed two, blowing the explosive bolts holding the reactor.

The cradle leaped for the sky so fast the wind whistled around it. Up, up, through the gleaming white wetness of clouds and into the blue.

Pain stabbed at Orem's ears. Too bad they didn't have pressure suits. The air was freezing.

For perhaps five minutes, the balloon climbed, then it slowed, and, fabric sagging like wet paper, drifted lazily.

"Still too low, Orem. Suggest you abort and land," upstairs said.

"No. No choice now. We're jumping." In a way, Orem felt relief. No more decisions.

"OK, everybody," he shouted. "Patients first, but we're getting out." He yanked the handle on the metal frame holding the cocoons. The frame flipped over, shooting the first cocoon down through the hatchway. Orem counted three seconds, then hit the handle again, repeating the procedure until all four cocoons were gone.

Then the six others jumped. Orem counted them off, then counted three seconds for himself. For a split second he paused. Far below he could see the mass of jungle. Here and there, wisps of white cloud blocked the view. On the far horizon, he could see mountains tipped with white, nearly invisible from the ground, but looking startingly near from up here. Just like Utah, he thought, and a sudden homesickness stabbed his heart. He wanted to show Suze the Great Salt Lake, take her hiking in the high Uintas, sit with her near Orem at sundown when the land darkened and the snow-capped peak of Mt. Timpanogas gleamed in the dying sunlight. He didn't want to die. He didn't want Suze to die, or anyone else.

He gritted his teeth, let go of his grip and stepped through the hatchway on to the open air.

Lightened, the cradle shot upwards, getting lots of altitude now that it did them no good.

He reached out, clutching the air with his hands like a sky diver, the long ribbons behind him flapping in his ears, hopefully slowing his fall. Far below, the four cocoons and the other crew hurtled down.

He twisted around to look at the western sky. Nothing. He looked the other way. Clouds, and lots more nothing.

"Where is the rocket?" he shouted.

Then he saw it, an arrowhead scratching a white line on the blue sky, intake scoop gaping open underneath.

"Hope you guys got those modifications right."

The dipper screamed by, too fast. It circled, lifting its nose and extending its wings, throttling back, hanging on the air, getting every gram of lift.

It swept by underneath, catching the first cocoon in its intake scoop.

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One down. Ten to go. Orem felt like shouting, singing. Now he wished they had labeled the cocoons. He had no idea which one was Suze.

The dipper flipped on its side, cutting a wide curve into the sky. Then it swooped back, snatching up cocoon number two.

It missed three, fluttering the long ribbons as it passed.

But it had the idea, now. Turning, it caught number three. Then it flew back and forth like a tractor plowing a field, collecting the other cocoon and the crew one by one.

Orem's turn. A whirring sound. He glanced back just in time to see a needle bug glide by. Rather he glided by the needle bug, for he was going faster. He looked down, then froze. He could see each tree, each leaf, even the glittering little windows left by the leaf eaters.

"God, hurry, hurry."

Lazily, the dipper flipped over, skidding through the sky like a skater on ice.

"Please, please." Now Orem could see the pattern of the bark on the tree trunks. The dipper finished its turn and started a leisurely approach. The wind screamed by his armored suit.

"Faster, faster," Orem pleaded as the dipper crawled around and vanished behind him.

Then a deafening bellow, and the lights went out. He smashed into a crash pad so hard it snapped his teeth together. An automatic door opened and a steel arm snatched him inside the dipper.

"You OK?" Mara kneeled over him. He was flat on his back and unable to speak.

For a second, he gasped for breath. Then the air came.

"Suze?"

"Good chance. They have a complete blood refresh ready upstairs. Everyone's OK. Thanks to you."

He closed his eyes. The dipper's engines roared, lifting them away from Amaterasu.

"Orem, I was wondering?" said Mara, touching his glove.

"Yes?" Was even Mara getting sentimental?

"When the shuttles are ready, how long will it take you to get the cradle back in operation?" ■

Kent Patterson
1941-1995

Kent Patterson died following a heart attack at his home on March 14, 1995. Despite more than his fair share of hardships in his life, Kent always retained an upbeat attitude and sense of fun that might well inspire many with less cause for complaint. He enjoyed lighter-than-air craft, wheelchair basketball, chess, and beachcombing, and an impish sense of humor brightened his stories in *Analog* and in other publications such as *Amazing, F&SF,* and *Pulphouse.*

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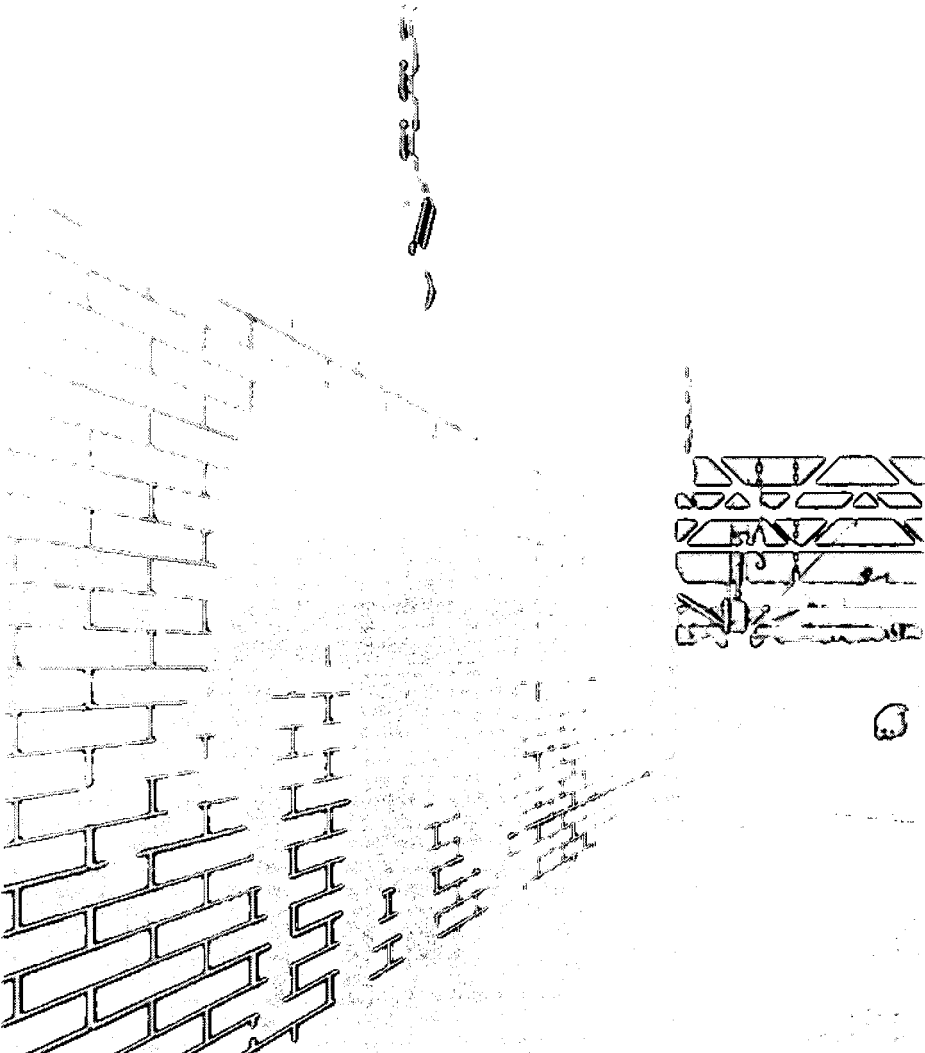

Illustration by George H. Krauter

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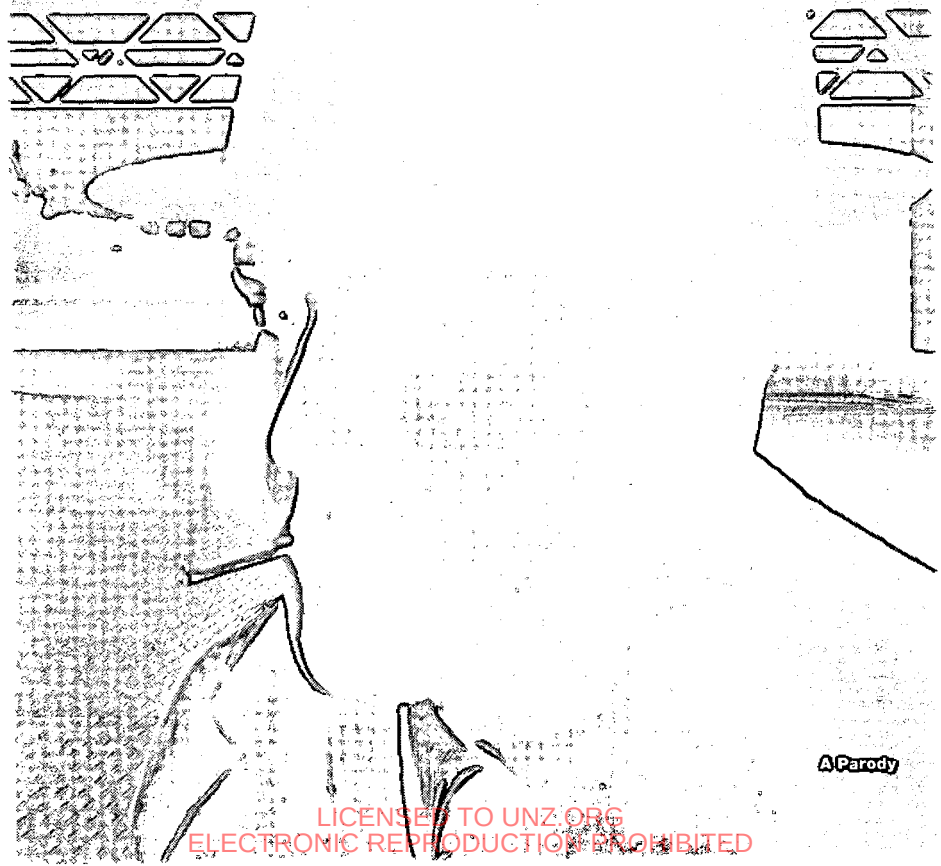
Harry Turtledove

THE MALTESE ELEPHANT



A Parody

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Miles Bowman was a man built of rectangular blocks. His head was one, squared off with short-cut graying hair at the top and a sharp jaw at the bottom. His chest and shoulders made a big brick, his belly below them a slightly smaller one. His arms and legs were thick, muscular pillars. He trimmed his nails straight across at the end of his fingers.

His partner Tom Trencher, that smiling devil, was dead. In the hallway outside the office, a sign painter was using a razor blade to scrape BOWMAN & TRENCHER off the frosted glass. When he was done, he would paint Bowman's name there by itself in gilt. Centered.

The phone rang. His secretary answered it. Hester Prine was a tall, skinny, brown-haired girl. She wore good clothes as if they were sacks. But when she spoke, any man who heard her had hungry dreams for days.

She covered the mouthpiece with her hand. "It's your wife."

Bowman shook his head. "I don't want to talk to Eva."

"She wants to talk to you about Tom."

"I figured she did. What else would she call me about here? I don't want want to talk to her, I told you. Tell her I'm out on a case. I'll see her tonight. She can talk to me then."

His secretary's mouth twisted, but she took her hand away and said what Bowman had told her to say. She had to say it three times before she could hang up. Then she rose and walked over to Bowman's desk in the inner office. She looked down at him. "You're a louse, Miles."

"Yeah, I know," he said comfortably. His arm slid around her waist. He pulled her closer to him.

"Louse," she said again, in a different tone of voice. She hesitated. "Miles, she wants to talk to you because—" She ran down like a phonograph that needs winding.

"Because she thinks I killed Tom." His hand tightened on her hip. He smiled. His teeth were not very good. "Why would she think a thing like that?"

"Because you know she and—" Hester Prine ran down again. "You're hurting me."

"Am I?" He did not let go. "I know lots of things. But I didn't kill Tom. Eva won't pin that one on me. The cops won't, either."

Soft footsteps came down the hall. They paused in front of the office. The sign painter stopped scraping. Hester Prine twisted away from Bowman. This time he did not try to stop her.

The door opened. By then Bowman's secretary was back at her desk. A woman walked into the office. The sign painter stared at her until the door closed and cut off his view. Then, with reluctant razor, he went back to work.

The woman was small and swarthy and perfect, with a heart-shaped face and enormous black eyes that could smile or sob or blaze or do all three at once, in the space of a couple of heartbeats. Her crow's-wing hair fell almost to her shoulders in a straight bob. It was not what they were wear-

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ing this year, but on her it was right. So was her orange crêpe silk frock with a flared peplum skirt.

She strode past Hester Prine as if the secretary did not exist and went into Bowman's inner office. He got up from in back of his desk. "Miss Lenoir," he said. He shut the door behind her.

"Your partner," Claire Lenoir said in a broken voice. "It's my fault." Tears glistened in her eyes, but did not fall.

"Not all of it," he answered. "Tom knew what he was doing, and you told him the guy he was tailing—the guy who's been tailing you—was one rough customer. You don't get into this business if you think everything is going to be easy all the time. Or you better not."

Her hands fluttered. She wore two rings, of gold and emeralds. They glowed against her dark skin. "But—" she said.

Bowman waved dismissively. "You mean that story you told us before? That didn't have anything to do with anything. If Tom and I had believed it, it might have, but we didn't. So don't worry about that. But you're going to have to level sooner or later, if you want me to do whatever you really want me to do."

The outer door opened. Hester Prine talked with someone—a man—for a few seconds. The phone on Bowman's desk jangled. He picked it up. "A Mr. Nicholas Alexandria wants to see you right now," his secretary said. "He says it's worth two hundred dollars."

"Have you seen the money?" Bowman asked.

"He's got it," she answered.

Bowman mouthed the name "Nicholas Alexandria" to Claire Lenoir. She started violently. The blood drained from her face, leaving her skin the color of old newspaper. She shook her head so her hair, for a moment, flew across her face. One strand stuck at the corner of her red-painted mouth. She brushed it away with an angry gesture.

"Send him in, sweetheart," Bowman said placidly. He hung up the telephone.

The man who came through the door might have been born in the city that gave him his name. He was darker than Claire Lenoir. His nose curved like a saber blade. His mouth, a Cupid's bow, was red but not painted. He stank of patchouli.

His eyes, hard and shiny and black as obsidian, flicked to Claire Lenoir and widened slightly. Then they returned to Bowman. "Your secretary did not say you had—this woman here," he said in a fussy, precise voice.

"Did you ask her?" Bowman asked. Nicholas Alexandria's eyes widened again. He shook his head, a single, tightly controlled gesture. Bowman said, "Then you've got no cause for complaint. I hear you're two hundred dollars interested in talking to me." He held out his hand, palm up.

Nicholas Alexandria's finely manicured hand drew from the pocket of his velvet jacket a wallet of tanned snakeskin. He removed from it four bills bearing the image of Ulysses S. Grant, held them out to Miles Bowman.

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Bowman took them, studied them, put them into his own wallet, and stuck it back in his hip pocket. "All right," he said. He waved to a chair. "Sit. Talk."

Alexandria sat. His red mouth contracted petulantly. "I might have known Miss Tellini would be here, when I wished to discuss with you matters pertaining to the Maltese Elephant."

Bowman's head turned on its thick neck. "Miss Tellini?" he asked Claire Lenoir.

"Gina Tellini," Nicholas Alexandria said with a certain cold relish. "Why? Under what name do you know her?"

"It's not important," Bowman answered. He smiled at the girl. "Got any others?"

Her skin darkened. She looked away from him. Nicholas Alexandria said, "That is the appellation with which she was born in the district of New York known as, I believe, Hell's Kitchen, any representations to the contrary notwithstanding." Gina Tellini spat something in Italian. Nicholas Alexandria answered in the same language, his diction precise. Her mouth fell open. His smile was frigid. In English, he said, "You see, I can get down in the gutter, too."

Miles Bowman held up a meaty hand. "Enough, already," he said. He waved to Alexandria. "You wanted to talk about the Maltese Elephant. Go ahead and talk."

"You are already familiar with this famous and fabulous creature?" Nicholas Alexandria inquired.

"Never heard of it," Bowman said politely.

Nicholas Alexandria gave another of his tightly machined head shakes. "I am afraid I cannot believe you, Mr. Bowman," he said. He reached inside his jacket once more. His hand returned to sight with a snub-nosed chromed automatic. He pointed it at Miles Bowman's chest. "Place both your hands wide apart on the desk immediately."

"You stinking little pansy," Bowman said.

Nicholas Alexandria's red, full lips narrowed into a thin pink slash. His tongue darted out like a snake's. The hand holding the automatic did not waver.

Bowman lowered a shoulder, twisted his body a little to one side. Then he spoke with savage satisfaction: "All right, Alexandria, now you've got a gun and I've got a gun. But you've got that cheap .22 and I'm holding a .45. You shoot me, I spend some time in the hospital getting patched up. I shoot you, pal, you're not just history, you're archaeology." He laughed loudly at his own wit. "Now put your little toy away and we'll talk."

"I do not believe you have a weapon," Nicholas Alexandria said.

"The more fool you," Bowman answered. "My partner didn't believe in packing a gun, and now the fool is dead. I'm a lot of things, but I'm no fool."

"He has it," Gina Tellini said. "I can see his hand on it."

"You would say the same in any case." Nicholas Alexandria's eyes did not move toward her. To Bowman, he

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said: "Shooting through the front of your desk does not strike me as likely to produce the results you would desire."

Bowman leaned back in his chair. One of his feet left the nubby, mustard-colored wool rug for a moment. It slammed against the inside of the center panel of the desk. The panel bowed outward. At the sudden crash, Nicholas Alexandria's finger tightened on the trigger. Then it eased again. Bowman's voice was complacent: "Cheap plywood, varnished to look like mahogany. A slug won't even know it's there."

Alexandria's mouth screwed tight, as if he were about to kiss someone he did not like. He slid the revolver back into the inner pocket of his jacket. As if he had never taken it out, he said, "Perhaps Miss Tellini did not see fit to tell you the Maltese Elephant—*a* Maltese Elephant, I should say—is in San Francisco now."

"No, she didn't tell me that," Miles Bowman said. He looked Gina Tellini up and down. Now her eyes were as flat and opaque as Nicholas Alexandria's. Bowman turned back to the man in the velvet jacket. "So what do you want me to do about it? Find this elephant and sell it to the circus?"

Nicholas Alexandria rose and bowed. "I see I am being mocked. I shall return another time, in the hope of finding you alone and serious."

"Sorry you feel that way." Bowman also got up. He came around the desk and stood towering over Nicholas Alexandria as he opened the door to let the slighter man out of the inner office.

Alexandria raised one finger. "A moment. Did you truly have a pistol?"

Bowman reached under his jacket. The motion exposed a battered leather holster on his right hip. He pulled out the Colt Model 1911A and let it lie, heavy and ugly and black, in his palm. It bore no frill, no ornament, no chromium. It was a killing machine, nothing else. Nicholas Alexandria stared at it. He let out a small, gasping sigh.

"I never bluff," Bowman said. "No percentage to it." He shifted the pistol in his hand. His fingers closed on the checkered grip. With a motion astonishingly fast from such a heavyset man, he slammed the Colt's hard steel barrel against the side of Alexandria's face. "Remember that."

The blow knocked Alexandria back two paces. He staggered but did not fall. The raised foresight had cut his cheek. Blood dripped onto his jacket. Slowly he removed the silk handkerchief from his breast pocket. He dabbed at the jacket, then raised the handkerchief to his face. "I shall remember, Mr. Bowman," he whispered hoarsely. "Rely on it."

He walked past Hester Prine without looking at her, and out of the office.

Gina Tellini brought her hands together several times, clapping without sound. "Now I know you will be able to protect me—Miles." She lingered half a heartbeat over his Christian name.

He shrugged. "All in a day's work. You have anything you want to tell me about this Maltese Elephant?"

Those quicksilver eyes betrayed an

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instant's alarm. Then they were her servants again. She shook her head. "I can't, not yet," she said huskily.

"Have it your way." Bowman's thick shoulders moved up and down once more. "You're going to, or Alexandria will, or somebody." He watched her. She stood very still, like a small, hunted animal. He shrugged a third time, motioned for her to precede him out of the inner office. "See you later."

When her footsteps could no longer be heard in the hall, he turned to Hester Prine. "I'm going home." He checked his wristwatch. "Quarter past seven already. Jesus, where does the time get to?" He set his hand on her shoulder. "Go on back to your place, too. To hell with all this."

She did not look at him. "I have some more typing to do," she said tonelessly.

"Have it your way," Bowman said, as he had to Gina Tellini. He closed the outer door—now it read BOWMAN, in letters bigger than BOWMAN & TRENCHER had been painted—and strolled down the hall to the elevator.

As he walked, he whistled "Look for the Silver Lining." He whistled out of tune. The elevator boy looked at him as he got into the cage. He looked back. The elevator boy suddenly got busy with the buttons and took him to the ground floor.

He walked across the street to the garage where he kept his Chevrolet. He threw the kid on the corner a nickel. The kid handed him a copy of the *San Francisco News*. He tossed it into the front seat of the car. The starter whined when he turned the key. Coughing, the motor finally caught. He put the Chevrolet in gear and drove home.

The house on Thirty-third Avenue in the Sunset district needed a coat of paint. The houses to which it was joined on either side had been painted recently, one blue, the other a sort of rose pink. That made the faded, blotchy yellow surface look all the shabbier.

Bowman bounded up the steps two at a time. He turned the key in the Yale lock, mashed his thumb down on the latch. With a click like a bad knee, the door opened.

The interior was all plush and cheap velvet and curlicued wood and overstuffed furniture. "Is that you, honey?" Eva's voice wafted out of the kitchen with the smell of pot roast and onions. She sounded nervous.

"Who else do you know with a key?" Bowman asked. He scaled his hat toward the couch. It fell short and landed on the fringe of the throw rug under the coffee table. He dropped the *News* onto the table.

Eva came out and stood in the kitchen doorway. He walked over, kissed her perfunctorily. They had been married thirteen years. She was ten years the younger. She was about the age Tom Trencher had been. Trencher wouldn't get any older.

Eva's short red curls got their color from a bottle. They'd been the same color when he married her, and from the same source. They went well with her green eyes. She was twenty pounds heavier now than when

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they'd walked down the aisle, but big-boned enough to carry the pounds well. She wore a ruffled apron over a middie blouse and a cotton skirt striped brightly in gold and blue.

Her smile was a little too wide. It showed too many teeth. "Do the police know anything more about—who killed Tom?" She looked at the point of his chin, not his eyes.

"If they do, they haven't told me. I didn't talk with 'em today." He shrugged. "Get me a drink."

"Sure, honey." She hurried away. She opened the pantry, then the icebox, and came back with a tumbler of bourbon on the rocks. "Here." That too-ingratiating smile still masked her face.

Bowman drank half the tumbler with two long swallows. He exhaled, long and reverently, and held up the glass to scrutinize its deep amber contents against the light bulb in the kitchen ceiling lamp. "This is the medicine," he announced, and finished the bourbon. He handed Eva the glass. "Fix me another one of these with supper."

"Sure, Miles," she said. "We ought to be just about ready." The pot lid clanked as she lifted it off to check the roast. She set it back on the big iron pot. The oven door hinge squeaked. "The meat is done, and so are the potatoes. I'll set the table and get you your drink."

Bowman buttered his baked potato, spread salt and pepper lavishly over the thick slab of red-brown beef Eva set before him. He ate steadily, methodically, without wasted motion, like a man shoveling coal into a locomotive firebox. Every so often, he sipped from the tall glass of bourbon next to the chipped china plate that held his supper.

Eva dropped her knife on the flowered linoleum floor. Bowman looked up for the first time since he'd seated himself at the table. Eva flushed. She flung the knife into the sink. Then she got up and took a clean one from the silverware drawer.

Before Bowman could resume his assault on the pot roast, she said, "Miles, honey, who do you think murdered Tom?"

"Had to be the guy he was shadowing," he answered. He speared another piece of meat with his fork, but did not raise it to his lips. "Thursday, that was his name. Evan Thursday." He ate the piece of meat. With his mouth full, he went on, "Couldn't have been anybody else." He swallowed, and smiled at Eva. "Could it?"

"No, I don't imagine it could," she said quickly. She bent her head over her plate. A moment later, her fork clattered to the floor. Her lips twisted. "I'm as twitchy as a cat tonight."

"Can't imagine why," Bowman said. He drank from the tumbler. Two ice cubes clinked against its side.

When supper was done, Bowman went out to the living room. He set what was left of his drink on the coffee table, then sat down on the sofa. The springs creaked under his weight. He bent over, grunting a little, untied his shoes, and tossed them under the table.

"Eva, get me my slippers," he said.

"What?" she called over the noise of running water in the kitchen. He

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repeated himself, louder. The water stopped running. Drying her hands on a dish towel, Eva bustled past him into the bedroom. She came back with the towel draped over her arm and the slippers in her hands. "Here they are." He slid them onto his feet. She returned to the dishes.

He smoked three cigarettes waiting for her to finish washing and drying them. When she came out, he handed her the tumbler. She washed it and dried it and put it away. He had opened the *News* by then, and was going through it front to back, as systematically as he ate.

Eva sighed softly and went over to a bookcase. She pulled out a sentimental novel and carried it into the bedroom. Bowman went on reading. When he came to the *Ships in Port* listing, he chewed thoughtfully on his underlip. He got up. In the clutter of papers and matchbooks in the top drawer of the hutch, he found a pencil. He underlined the names of four ships:

Daisy Miller from London
La Tórtola from Gozo
Admiral Byng from Minorca
Golden Wind from Bombay

After he read the advertisements on the other side of the page that held *Ships in Port*, he tore out the three-inch length of agate type and stuck it in his trouser pocket. Then he worked his way through the rest of the newspaper.

"Miles?"

Bowman looked up. Eva stood in the doorway that led to the bedroom. She was wearing a thin, clinging silk crêpe de chine peignoir. Bowman had given it to her for their anniversary a few years before. She did not wear it very often.

"It's getting late," she said. "Aren't you coming to bed?" She had not washed off her makeup and smeared her face with cold cream, the way she usually did at bedtime.

Bowman folded up the paper and tossed it on the floor. His fingers were stained with ink from the cheap newsprint. He rubbed them on the thighs of his pants, rose from the couch. "Don't mind if I do," he said.

A hard fist pounded on the front door. Bowman sat up in bed. The pounding went on. "Who's that?" Eva asked, her voice half drunk with sleep.

"Damned if I know, but I'm going to find out." Bowman groped for the switch on the lamp by the bed. He flicked it, and screwed up his eyes against the sudden flare of light. He peered at the alarm clock on the nightstand by the lamp. Midnight. Scowling, he got out of bed. He had hung his holster on a chair. He pulled out his pistol, clicked off the safety.

"What are you going to do?" Eva asked. The cold cream made her round cheeks glisten like the rump of a greased pig.

"See who it is," Bowman answered reasonably. "You stay here." He slid into his pajama bottoms and padded out toward the door. For a bulky man, he was surprisingly light on his feet. He closed the bedroom door after him.

The pounding had slowed when the light went on. Bowman yanked

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the door open. He pointed the pistol at the two men on the front porch. A moment later, he lowered it. "Jesus Christ," he said. "You boys trying to get yourselves killed? I knew cops were dumb, but this dumb?" He shook his head.

"We've got to talk to you, Miles," one of the policemen said. "Can we come in?"

"You got a warrant, Rollie?" Bowman asked.

"Not that kind of talk, I swear." Detective Roland Dwyer crossed himself to show he was serious.

Bowman considered. He nodded gruffly. "All right, come in, then," he said, and turned on the imitation Tiffany lamp on the table by the door. "But if you and the Captain here are playing games with me—" He did not say what would happen then, but left the implication it would not be pretty.

"Thanks, Miles," Dwyer said with an air of sincerity. He was a tall Irishman heading toward middle age. His hair had naturally the color to which Eva's aspired. His face was long and ruddy and triangular, with a wide forehead and a narrow chin. He wore a frayed shirt collar and pants shiny with wear at the knees: he was, on the whole, an honest cop.

Bowman waved him toward the sofa. The Captain followed him in. Bowman quickly closed the door. The night was chilly, and had the clammy dankness of fog. Bowman sat down in the rocking chair next to the table that held the lamp with the colored glass shade. His voice turned hard: "All right, what won't keep till morning?"

Dwyer and the Captain looked at each other. The latter was a short, pudgy man, a few years older than Bowman. He had a fringe of silver hair futilely clinging to the slopes of his pate, skin as fine and pink as a baby's, and innocent blue eyes. His suit was new, and tailored in the English fashion. He smelled of expensive Bay Rum after-shave lotion.

After a brief hesitation, the Captain said: "Evan Thursday's dead, Miles. One slug, right between the eyes."

"So?" Bowman said. "Good riddance to him is all I have to say, Bock."

Captain Henry Bock steepled his fingers. He pressed them so tight together, the blood was forced from their tips, leaving them pale as boiled veal. "Where have you been tonight, Miles?" he asked delicately.

Bowman heaved himself out of the rocker. He took two steps toward the Captain before he checked himself. "Get out of here," he snarled. "Rollie tells me everything's going to be jake, and you start with that—" He expressed his opinion with vehemence, variety, and detail.

Roland Dwyer spread his hands placatingly. "Come on, take it easy," he said. "This guy gets iced, we have to talk to you. We think he shot Tom, after all, and Tom was your partner."

"Yeah? Is that what you think?" Bowman made a slashing gesture of disgust with his left hand. "Looked like you were trying to pin Tom on me. Or do you figure I took care of both of 'em now?"

"Where have you been tonight?" Captain Bock repeated.

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"At the office and here, dammit, nowhere else but," Bowman said. "Ask my secretary when I left, ask Eva when I got here. You want me to get her out so you can ask her?" He glanced over to the closed bedroom door. "Only take a minute."

"It's all right, Miles," Detective Dwyer said. "We believe you." He looked over at Henry Bock again. "Don't we, Captain?"

Bock shrugged. "Neither of those women is likely to tell us anything different from what Bowman says, anyhow."

The Captain had spoken quietly. Bowman glanced at the bedroom door again. When he answered, he too held his voice down, but anger blazed in it: "And what the hell is that supposed to mean? You come round here with one load of rubbish, and now you start throwing around more? I ought to—"

"Shut up, Bowman," Captain Bock said flatly. "What the women say doesn't matter, not this time. Thursday caught his right outside Kezar Stadium, in Golden Gate Park. If you'd arranged to meet him there, it wouldn't have been five minutes out of your way."

"And if pigs had wings—" Bowman stood up, opened the front door. "Get out," he growled. "Next time you come here, you bring a warrant, like I said. My lawyer'll be here with me, too."

"I'm sorry, Miles," Dwyer said. "We're doing our job, too, remember. You aren't making it any easier for us, either."

"Go do it somewhere else," Bowman said.

The two policemen got up and walked into the building fog. They got into their car, which they had parked behind Bowman's. The heavy, wet air muffled the sound of the motor starting. In the fog, the beams the headlamps cast seemed thick and yellow as butter.

Bowman shut the door and locked it. He went back into the bedroom, replaced the pistol in its holster. Eva was sitting up, reading the novel she'd abandoned earlier. "What—did they want?" she asked hesitantly.

"Somebody punched that Evan Thursday's ticket for him," Bowman answered.

"And they think it was you?" Eva's eyes widened. "That's terrible!"

"It's nothing to worry about," Bowman said, shrugging. "I didn't do it, so they can't pin it on me, right?" He lay down beside her, clicked off the lamp on his side of the bed. He yawned. "You going to look at that thing all night?"

"No, dear." Eva put down the book and turned off her lamp. Although she stretched out next to Bowman, she wiggled and fidgeted the way she did when she was having trouble going to sleep. Bowman shrugged once more, breathed heavily, then soon began to snore.

The telephone rang, loud in the night as a fire alarm. Bowman thrashed, twisted, sat up, and turned on the bedside lamp. The alarm clock said it was almost three. He shook his head. "I don't believe this."

The phone kept ringing. "Answer

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it," Eva told him. She pulled the pale blue wool blanket up over her head.

Muttering, he walked into the living room. He snatched the earpiece off the hook, picked up the rest of the instrument, and barked his name into the mouthpiece: "Bowman." The voice on the other end of the line spoke. "Now?" Bowman asked. "Are you sure? . . . Jesus Christ, it's three in the morning . . . all right, if that's the way it's got to be . . . . Room 481, right? See you there . . . . Yeah, fifteen minutes if the fog's not too thick."

He slammed the mouthpiece down on his goodbye, stalked back into the bedroom. Eva had turned off the light. He turned it on again. He unbuttoned the shirt to his pajamas and walked naked to the dresser.

"What's wrong?" Eva asked as he pulled a clean pair of white cotton boxer shorts out of a dresser drawer. "Why are you getting dressed?" She sounded frightened.

"I'm going down to the station." He got into the same trousers he had worn the day before. "Bock and Dwyer, they have some more questions for me." He put on socks and shoes, got a fresh shirt from the closet, knotted a tie with a jungle pattern of hot blues and oranges and greens, shrugged a jacket over his wide shoulders. He ran a comb through his hair, then planted a curled-brim fedora on his head.

"Shouldn't you call your lawyer?" Eva said.

"Nah, it'll be all right." He started out. At the bedroom door, he stopped and blew her a kiss.

The fog was there, but not too thick. He had the roads all to himself. Once his Chevrolet and a police car passed each other on opposite sides of the street. He waved to the men inside. One of them recognized him and waved back.

He turned right off Market onto New Montgomery. During business hours, no one could have hoped to find a parking space there. Now the curb was his to command. He walked over to the eight-story Beaux Arts building of tan brick and terra cotta at the corner of Market and New Montgomery. A man in uniform held the door open for him. He strode across the lobby to the bank of elevators.

"Fourth floor," he told the operator as he got into one.

"Fourth floor, yes, sir," the man answered. "Welcome to the Palace Hotel."

Bowman stood with his feet slightly spread, as if at parade rest. He looked straight ahead. The elevator purred upward. When it got to the fourth floor, the operator opened the cage. Bowman stepped out while the fellow was telling him the floor.

A sign on the wall opposite the elevator announced:

401-450 ← 451-499 →

Bowman went. The carpet in the hall was so thick that the pile swallowed the welt of his shoe each time his weight came down on it. He paused a moment in front of room 481, then folded his thick hand into a fist and rapped on the door just below the polished brass numbers.

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It opened. "Come in," Gina Tellini said. She looked as fresh as she had the afternoon before, but at some time between then and now had changed into a dark green velvet lounging robe of Oriental cut. The front of a Chinese dragon, embroidered in deep golds and reds, coiled across her breast.

Bowman stepped into the hotel room. Gina Tellini closed the door after him. As she started back past him, he said, "Thursday's dead."

She stopped in her tracks. A hand started to fly up to her mouth, but checked itself. "How do you know that?" she asked in a shaken voice.

"Cops—how else?" He barked mirthless laughter. "They want to put that one on my bar tab, too, along with Tom." His lips thinned, stretching his mouth into a speculative line. "You could have done it. You would have had time, after you left the office."

"No, not me." She dismissed the idea in three casual words. "Here, sit down, make yourself comfortable." She waved Bowman to a chair upholstered in velvet two shades lighter than her gown. She sat down on the edge of the bed facing him. The bed had not been slept in since the maid last prepared it.

"All right, not you," Bowman said agreeably, crossing his legs. "Who, then?"

"It could have been Nicholas Alexandria," Gina Tellini said. "He carries a gun. You saw that."

"Yeah, I saw that. It could have been. But a lot of people carry guns. I carry one myself. 'Could have been' doesn't cut much ice."

"I know." Gina Tellini nodded. The motion made the robe come open, very slightly, at the neckline. "But somebody besides Alexandria wants the Maltese Elephant."

"Somebody besides Alexandria and you." Bowman's gaze focused on the point, a few inches below her chin, where velvet had retreated. "Thursday's dead. Who else is there?"

"A man named Gideon Schlechtman," she answered promptly. "Sometimes he and Alexandria work together, sometimes Alexandria is on his own, or thinks he is. But if he gets the Elephant, Schlechtman will try to take it from him."

"I bet he will," Bowman said. "And what about you and Alexandria and what's-his-name, Schlechtman? I bet the three of you are one big happy family, right?"

"It's not funny, Miles," Gina Tellini insisted. "Schlechtman is—dangerous. If Evan Thursday is dead, that's all the more reason to believe he's come to San Francisco."

"Is that so?" Bowman said. "All I have is your word, and your word hasn't been any too real good, you know what I mean? And if this here Schlechtman is real and is in town, whose side are you on?"

"That's a terrible question to ask." Gina Tellini's eyes blazed for a moment. Then sudden tears put out the fire. "You don't believe a word I've told you. It's so—hard when you don't trust me. I'm here in your city all alone and—" The rest was muffled when she buried her face in her hands.

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Bowman rose from the chair, sat down beside her on the bed. "Don't get upset, sweetheart," he said. "One way or another, I'll take care of things."

She looked up at him. Lamplight sparkled on the tracks two tears had traced on her cheeks. "I'm so damned tired of always being alone," she whispered.

"You're not alone now," he said. She nodded, slowly, her eyes never leaving his. He slipped his left arm around her shoulder, drew her to him. Her lips parted. They kissed fiercely. When they fell back to the mattress together, his weight pinned her against its firm resilience.

The rumble of a cable car and the clang of its bell outside the window woke Miles Bowman. The gray light of approaching dawn seeped through the thick brocaded curtains of Gina Tellini's room.

Moving carefully, Bowman slid out from under her arm. She stirred and murmured but did not wake. Bowman dressed with practiced haste. The door clicked when he closed it. He paused outside in the hall. No sound came from within. Satisfied, he walked back to the elevator.

More automobiles were on the street now, but not too many to keep Bowman from making a U-turn on New Montgomery. He turned right onto Market Street and took it all the way to the Embarcadero.

The Ferry Building was quiet. Its siren would not wail for another two hours, not until eight o'clock. Through the thinning fog, its high clock tower loomed, brooding and sinister. Man-o'-War Row and berths for passenger liners stretched south of the Ferry Building, commercial piers for foreign lines north and west around the curve of the shore. Bowman turned left, toward them, onto the Embarcadero. Between gear changes, his right hand grubbed in his trouser pocket. He pulled out the piece of newsprint he had torn from the *San Francisco News*.

He parked the car and got out. His nostrils dilated. The air was thick with the smells of rotting piles and roasting coffee, mud and fish and salt water. Sea gulls mewed like flying cats. He padded along, burly as the longshoremen all around but standing out from them by virtue of jacket and collar and tie.

The *News* listed ships in order of the piers at which they were docked. The Daisy Miller was tied by Pier 7. Shouting dock workers loaded wooden crates onto her. Stenciled letters on the sides of the crates declared they held sewing machines. They were the right size for rifles. Bowman shrugged and walked on to Pier 15, where La Tórtola was berthed.

A handful of sailors worked on deck, swabbing and painting under the watchful eye of a skinny blond man in a black-brimmed white officer's cap and a dark blue jacket with four gold rings circling each cuff. He saw Bowman looking at him. "What do you want, you?" he called. He had a German accent, or maybe Dutch.

Bowman put hands on hips. "Who wants to know?"

"I am Captain Wellnhofer, and I

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have the right to ask these questions. But you—" The captain's face had been pale. Now it was red and angry.

"Keep your shirt on, buddy," Bowman said. He looked down at the scrap of newspaper in his hand. "This here the boat that's supposed to get another load of fodder today?"

Captain Wellnhofer's face got redder. "Do you not know in your own language the difference between a boat and a ship? And we have no need for fodder now. You are mistaken. Go away."

The Admiral Byng was docked at Pier 23. Nobody aboard her admitted any need for fodder, either. Bowman grimaced and hiked on to Pier 35, which held the Golden Wind. "Halfway to Fisherman's damn Wharf," he muttered. The only men visible aboard her were little brown lascars in dungarees. None of them seemed to speak any English. Bowman held a couple of silver dollars in the palm of his hand. A lascar hurried to the rail with a sudden white smile. Bowman tossed him one of the coins. He asked the same question he had before. The lascar didn't understand fodder. "Hay, straw, grain—you know what I mean," Bowman said.

"You crazy?" the lascar said. "We got tea, we got cotton, we got copra. We take away steam engines, petrol engines. You think maybe we feed them this grain?" He spoke in his own singsong language. The other lascars laughed.

"Yeah, well, just for that, funny guy—" Bowman jammed the other silver dollar back into his trouser pocket. The lascar's Hindustani oaths followed him as he strode down the pier toward the Embarcadero. He paused at the base of the pier to scribble a note: *Expenses—Information—$2.* Then he walked back along the curb of the harbor to his automobile.

He parked it in the garage across the street from his office. Lounging against the brick wall not far from the entrance was a burly middle-aged man with the cold, hard, angular features of a Roman centurion. With its wide, pointed lapels, padded shoulders, and pinstripes, his suit stood on one side or the other of the line between fashion and parody. Bowman looked him over, then started up the steps.

The lounger spoke: "You don't want to go in there. You want to come with me."

"Yeah? Says who?" Bowman dropped his right hand from the doorknob. It came to rest at his side, near waist level.

"Says my boss—he's got a business proposition to put to you," the fellow answered. He stood straighter. One of his hands rested in the front pocket of his jacket. "And says me. And says—" The hand, and whatever it held, moved a little, suggestively.

Bowman came down the steps. "All right, take me to your boss. I'll talk business with anybody. As for you, pal, you can get stuffed." He spoke the words lightly, negligently, as if he didn't care whether the hard-faced man followed through on them or not.

The hard-faced man took a step toward him. "You watch your mouth, or—"

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Bowman hit him in the pit of the stomach. His belly was hard as oak. Against a precisely placed blow to the solar plexus, that proved irrelevant. He doubled over with a loud, whistling grunt. His suddenly exhaled breath smelled of gin. While he gasped for air, Bowman plucked a revolver from his pocket and put it in his own. He hauled the burly man back to his feet. "I told you—take me to your boss."

The man glared at him. Hatred smoldered in his eyes. He started to say something. Bowman shook his head and raised a warning forefinger. The burly man visibly reconsidered. "Come on," he said, and Bowman nodded.

The seventeen-story white brick and stone Clift Hotel on Geary Street was five blocks west of the Palace. The hard-faced man said nothing more on the way there, nor through the lobby, which was decorated in the style of the Italian Renaissance. He and Bowman took the elevator to the fourteenth floor in silence. He rapped at the door to suite 1453.

Nicholas Alexandria opened it. His chrome-plated pistol was in his hand. "Ah, Mr. Bowman, so good to see you again," he said in a tone that belied the words. His left hand rose to a sticking plaster on his cheek. The plaster did not cover all the bruise there. "Won't you come in?"

"Don't mind if I do," Bowman said, and stepped past him. The suite was furnished in spare and modern style. Gina Tellini sat on a chair that looked as if it might pitch her off at any moment. She sent Bowman a quick, nervous glance, but did not speak. Nicholas Alexandria closed the door, sat on a similar chair beside her.

The couch opposite them was low and poorly padded enough to have come from ancient Greece. On it, hunched forward as if not to miss anything, sat a thin, pale, long-faced man with a lantern jaw and gold-rimmed spectacles. He wore a suit of creamy linen, a Sea Island cotton shirt, and a burgundy silk tie whose bar was adorned with a small silver coin, irregularly round, that displayed a large-eyed owl.

"Schlechtman?" Bowman said. The pale man nodded. Bowman took the revolver out of his pocket. He handed it to him. "You shouldn't let your little chums play with toys like this. They're liable to get hurt."

The hard-featured man who had unwillingly brought Bowman to the Clift Hotel flushed. Before he could speak, Gideon Schlechtman held up a hand. His fingers were long and white, like stalks of asparagus. "Hugo, that was exceedingly clumsy of you," he said, his voice dry, meticulous, scholarly.

He glanced a question at Bowman. Bowman nodded. Schlechtman returned the revolver to Hugo. The burly man growled wordlessly as he received it.

Bowman said: "Your bully boy tells me you want to talk business."

Schlechtman shifted so he could draw a billfold from his left pocket. From the billfold he took a banknote with a portrait of Grover Cleveland. He set it on the black lacquered table in front of him. Four more with the same portrait went on top of it. "Do

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you care for the tone of the conversation thus far?" he enquired.

"Who wouldn't like five grand?" Bowman asked hoarsely. His eyes never left the bills. "What do I have to do?"

"You have to deliver to me, alive and in good condition, the Maltese Elephant currently in this fair city of yours," Gideon Schlechtman replied.

"If you'll pay me five thousand for it, it's worth plenty more than that to you," Bowman said. Schlechtman smiled. He had small white even teeth. Gina Tellini caught her breath. Bowman went on: "I ought to have something to work from. Give me two grand now."

Gideon Schlechtman pursed his lips. He took one bill from the top of the stack, held it out to Bowman between thumb and forefinger. Bowman seized it, crumpled it, stuffed it into the trouser pocket where he kept his keys. Schlechtman neatly replaced the rest of the banknotes in his wallet. The wallet returned to the pocket from which it had come. Nicholas Alexandria sighed.

"All right," Bowman said. "Next thing is, everybody here knows more about this damned elephant that I do. Even Hugo does, if Hugo knows anything about anything."

"Why, you lousy—" Hugo began.

Again Schlechtman held up his hand. Again Hugo subsided into growls. Schlechtman said, "Your request is a fair one, Mr. Bowman. If you are to assist us with your unmatchable knowledge of San Francisco, you must also have some knowledge of the remarkable beast we seek.

"Though the Maltese Elephant has of course been known since haziest antiquity to the human inhabitants with whom it shares its island, it was first memorialized in literature in the *Periplus* of Hanno the Carthaginian, which was translated from Punic to Greek in the fourth century, B.C. Hanno's is a bald note: θηρίδιον ὁ ἐλέφας Μελίτης ἐστίν."

"It's Greek to me, by God," Bowman said.

Schlechtman continued his lecture as if Bowman had not spoken: "Aristotle, in the *Historia Animalium* 610ª15, says of the Maltese Elephant, ὁ ἐλέφας ὁ Μελιταῖος μεγέθει ὅμοιος τῇ νήσῳ ἐν ᾗ οἰκεῖ. And Strabo, in the sixth book of his geography, notes Maltese dogs shared a similar trait: πρόκειται δὲ τοῦ Παχύνου Μελίτη, ὅθεν τὰ κυνίδια τε καὶ ἐλεφαντίδια, ἃ καλοῦσι Μελιταῖα, καὶ Γαῦδος, Gaudos being the ancient name for Malta's island neighbor.

"The Maltese Elephant retained its reputation in Roman days as well. In the first century B.C., Cicero, in his first oration against Verres, claims, *Et etiam ex insulolae Melitae elephantisculos tres rapiebat*. More than a century later, Petronius, in the one hundred thirty-second chapter of the *Satyricon*, has his character Encolpius put the curled and preserved ear of a Maltese Elephant to a use which, out of deference to the presence here of Miss Tellini, I shall not quote even in the original. And in the fifth century of our era, as St. Augustine sadly recorded in the *Civitas dei, Res publica romanorum in statu*

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elephantis Melitae nunc deminuttur. So you see, Mr. Bowman, the beast whose trail we follow has a history extending back toward the dawn of time. I could provide you with many more citations—"

"I just bet you could," Bowman interrupted. "But what does any of 'em have to do with the price of beer?"

"I am coming to that, never fear," Gideon Schlechtman said. "You were the one who complained of lack of background. Now I have provided it to you. In the foreground is the presence on Malta since 1530 of the Knights of St. John of Jerusalem. During the great siege by the Ottoman Turks in 1565, a Maltese Elephant warned of an attack with its trumpeting. Since that time, it has come to be revered as a good-luck totem not only by the Knights but also by the great merchants who, under the British crown, are the dominant force on Malta today. The return of one of these beasts to its proper home would be . . . suitably appreciated by these men."

"Yeah? If they're so much in love with these elephants of theirs, how'd one of 'em go missing in the first place?" Bowman demanded.

"Evan Thursday knew the answer to that question, I believe," Schlechtman answered. "He is, unfortunately, in no position to furnish us with it. Unless, that is, he conveyed it to Miss Tellini. Her involvement in this affair has been, shall we say with the charity Scripture commends, ambiguous."

"He didn't," Gina Tellini said quickly. "I have a cousin on Malta, in Valetta, who—hears things. That's how I found out."

Bowman shrugged. "It's a story. I've heard a lot of stories from her." His voice was cool, indifferent.

Her flashing eyes registered anger, with hurt hard on its heels. "It's true, Miles. I swear it is."

"Her word is not to be trusted under any circumstances," Nicholas Alexandria said.

"As if yours is," Gina Tellini retorted hotly.

Bowman turned back to Gideon Schlechtman. "The five grand is mine provided I find this Maltese Elephant for you, right?"

"Provided we do not find it first through our unaided efforts, yes," Schlechtman said.

"Yeah, sure, I knew you were going to tell me that," Bowman said, indifferent again. "But if you thought you could do it on your own, you never would've dragged me into it." He started for the door. Passing Hugo, he patted him on his hip. "See you around, sweetheart."

Hugo slapped his hand away, cocked a fist. Beefy face expressionless, Bowman hit him in the belly again, in the exact spot his fist had found before. Hugo fell against an end table of copper tubing and glass. It went over with a crash.

At the door, Bowman looked back to Gideon Schlechtman. "A smart man like you should get better help."

He closed the door on whatever answer Schlechtman might have made. Waiting for the elevator, he peered back toward suite 1453. No one came out after him. The elevator door opened. "Ground floor, sir?" the oper-

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ator asked.

"Yeah."

Bowman stepped into his office. Hester Prine stared up from her typing. Relief, anger, and worry warred on her face. "Where have you been?" she demanded. "Your wife has called three times already. She asked me if you were under arrest. Are you?"

"No." Bowman hung his hat on the tree. "I'd better talk to her this morning. Anybody else call?"

"Yes," she said in her lascivious voice. She looked down at the pad by her telephone. "He said his name was Wellnhofer." She spelled it. "He said he'd already talked to you once today, and he wanted to see you by ten. I was sure you'd be in—I was sure then, anyhow."

"What did he sound like?" Bowman asked.

"He had an accent, if that's what you mean."

Bowman did not answer. He went into his inner office, closed the door. He sat down in the swivel chair, lit a cigarette, and sucked in harsh smoke with quick, savage puffs. After he stubbed it out, he picked up the phone and called. "Eva? . . . Yeah, it's me. Who else would it be? . . . No, I'm not in jail, for God's sake . . . . What do you mean, you called them up and they said they didn't have me? . . . What time was that? . . . I was gone by then . . . . No, I didn't see any point to coming home when I had to go in to the office anyway. I ate breakfast and did some looking around. Now I'm here. All right?"

He hung up, smoked another cigarette, and went back out of his private office. From his pocket he took the silver dollar he had not given to the lascar sailor. He dropped it on his secretary's desk. It rang sweetly. "Go around the corner and get me some coffee and doughnuts. Get some for yourself, too, if you want."

"I thought you already ate breakfast," she said. She picked up the cartwheel and started for the door.

Bowman swatted her on the posterior, hard enough to make her squeak. "I'm going to have to soundproof that door," he said gruffly. "Go on, get out of here."

He returned to his office, pulled the telephone directory off its shelf, pawed through it. "Operator, give me McPherson's Agricultural Supplies." He drummed his fingers on the desk. "McPherson's? Yeah, can you tell me if you've filled any big, unusual orders for hay the last couple of days? . . . No? All right, thanks." He went through the book again. "Let me have the manager." He asked the same question there. He received the same answer, and slammed the earpiece back onto its hook.

The outer door opened. Hester Prine came in with two cardboard cups and a white paper sack. Grease already made the white paper dark and shiny in several places.

"I thought maybe you were Wellnhofer," Bowman said.

"No such luck." Hester Prine took a half dollar, a dime, and a nickel from her purse and gave them to Bowman. He dropped them into his pocket. She opened the bag and handed him a doughnut whose sugar glaze glis-

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tened like ice on a bad road. He devoured it, drained his coffee. She pointed to the bag and said, "There's another one in there, if you want it."

"Don't mind if I do." Bowman was reaching for it when several sharp pops, like firecrackers on Chinese New Year, sounded outside the office building. Down on the street, a woman screamed. A man cried out. Bowman snatched the doughnut from the bag. "That's a gun," he said, and ran for the stairs.

He gulped down the last of the doughnut as he burst out into the fresh air. The man who lay crumpled on the sidewalk wore a navy blue jacket with four gold rings at each cuff. His cap had fallen from his head. It lay several feet away, upside down. The brown leather sweatband inside was stained and frayed.

"I called the cops," a man exclaimed. "A guy in a car shot him. He drove off that way." The man pointed west.

Bowman squatted beside Captain Wellnhofer. The seaman had taken two slugs in the chest. Blood soaked his shirt and jacket. It puddled on the pavement. He stared up at Bowman. His eyes still held reason. "Warehouse," he said, and exhaled. Blood ran from his nose and mouth. With great effort, he spoke through it: "Warehouse near Eddy and Fillm—" He exhaled again, but did not breathe in. He looked blindly up at the pale blue morning sky.

Bowman was getting to his feet when a car pulled to a screeching stop in front of him. Out sprang Detective Dwyer and Captain Bock. Bock looked from Bowman to the corpse and back again. "People have a way of dying around you," he remarked coldly.

"Go to hell, Bock," Bowman said. "You can't pin this on me. Don't waste your time trying. I was upstairs with Hester when the shooting started." He pointed to the man who had said he had called the police. "This guy here saw me come out."

"What were you doing up there with Hester?" Dwyer asked, amusement in his voice.

"Eating a doughnut. What about it?"

"You've got sugar on your chin," Dwyer said.

Bowman wiped his mouth on his sleeve. Bock asked several questions of the man who had called the police. His mouth curling down in disappointment, he turned back to Bowman. "Do you know the victim?" he asked.

"His name's Wellnhofer," Bowman answered willingly. "He was coming to see me. He had a ten o'clock appointment." He looked at his watch. "He was early. Now he's late."

"You were down there by him when we drove up," Dwyer said. "Did he say anything to you before he died?"

"Not a word," Bowman assured him. "He must have been gone the second he went down."

"Two in the chest? Yeah, maybe," Dwyer said.

"Are you going to take a formal statement from me, or what?" Bowman asked. "If you are, then do it. If you aren't, I'm going back upstairs."

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He jerked a thumb in the direction of Wellnhofer's body. "A hole just opened up in my schedule."

"You're a cold-blooded so-and-so," Dwyer said. He and Captain Bock walked over to their car and put their heads together. When they were done, Dwyer came back to Bowman. "Go on up, Miles. We've got enough from you for now. If we need more later, we know where to find you."

"Yeah, I know," Bowman said bitterly.

Hugo pushed the room-service cart to the door of Gideon Schlechtman's suite in the Clift Hotel. He opened the door, pulled the cart through, left it in the hall. Then he closed the door and returned to the others in the ever so modern living room.

To Schlechtman, Bowman said: "Much obliged. Lobster and drawn butter, baked potato. I usually like my liquor hard, but that wine was tasty, too."

"That was a Pouilly-Fumé from the valley of the Loire, Mr. Bowman, and a prime year, too," Gideon Schlechtman replied, steepling his long, thin, pale fingers.

"Didn't I say it was good?" Bowman asked equably. "Now, before we go any further, we have to figure out who gets thrown to the wolves. There's three bodies with holes in 'em lying on slabs in the morgue. That kind of business gets the cops all up in arms. They're going to be looking for somebody to blame. If we give 'em somebody, they won't do any real digging on their own. Cops, they're like that."

"Whom do you suggest, Mr. Bowman?" Schlechtman enquired.

"Hugo's just hired muscle," Bowman answered. "Turn up a flat rock and you'll find a dozen like him. Dwyer and Bock'll see it the same way."

The hard-faced man snarled a vile oath. He yanked out his revolver and pointed it at Bowman's chest. Schlechtman raised his hand. "Patience, Hugo. I have not said I agree to this. What other possibilities have we?"

Bowman shrugged. "Alexandria there's a squiff. With three strapping men dead, that might do. Rollie Dwyer, he's got seven kids."

"You are an insane, wicked man," Nicholas Alexandria cried shrilly. His hand darted inside his coat. Lamplight glittered from his chromed automatic. He aimed the little gun at Bowman's face. Hugo still held his pistol steady.

"Nicholas, please." Schlechtman held up his hand again. "We do have a problem here which merits discussion. Everything is hypothetical." He turned back to Bowman. "Why not Miss Tellini?"

"We could work the frame that way, for Tom and Thursday, anyhow," Bowman said. "A guy plugged Wellnhofer, though. We'd have to drag in Hugo or Alexandria any which way."

Gina Tellini sent Bowman a Bunsen burner glance. "Why not Schlechtman?" she demanded.

"Don't be stupid, darling," Bowman answered. "He's paying the bills."

"Whoever finds the Maltese Elephant can pay the bills," she said.

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"If we find the Elephant, we shall be able to pay the attorney's fees to keep us from the clutches of the intrepid San Francisco police, as well," Gideon Schlechtman said. He pointed to Hugo and to Nicholas Alexandria in turn. "Put up your weapons. We are all colleagues in this matter. And, as the saying has it, if we do not hang together, we shall hang separately."

"You're the boss," Hugo said. He put the gun back in his pocket. His muddy eyes raked Bowman once more. Nicholas Alexandria bit his lip. Purple and yellow bruises still discolored his cheek. He had taken off the sticking plaster that covered the dried-blood scab on the cut Bowman's pistol had made there. At last, the little chromed automatic disappeared.

Schlechtman smiled. The stretch of lips was broader and more fulsome than his rather pinched features could comfortably support. "Shall we be off, Mr. Bowman?" he said.

Bowman got to his feet, went to the window, pulled aside the curtain. He looked at the night, than at his watch. "Give it another half hour," he said. "I want it good and dark, and the fog's starting to roll in, too."

"How fitting," Schlechtman remarked. "This whole business of the Elephant has been dark and foggy."

At the hour Bowman had chosen, they left suite 1453 and rode down to the Clift's elegant lobby. Outside, the fog had thickened. It left the taste of the ocean on the lips. Defeated streetlamps cast small reddish-yellow puddles of light at the foot of their standards. Automobile headlamps appeared out of the mist, then were swallowed up once more. Walking in the fog was like pushing through soaked cotton gauze.

Hugo looked around nervously. His hand went to the pocket where the revolver nested. "I don't like this," he muttered.

"We've got three guns with us—at least three," Bowman amended, glancing from Schlechtman to Gina Tellini. "You don't like those odds, go home and play with dolls."

"You're pushing it, Bowman. Shut your stinking mouth or—"

"After the Elephant is in our hands, these quarrels will seem trivial," Gideon Schlechtman said. "Let us consider them so now."

They walked four blocks down Taylor to Eddy, then turned right onto Eddy. "It's a mile from here, maybe a little more," Bowman said. He lit a cigarette. Fog swallowed the smoke he blew out.

As they passed Gough, shops and hotels and apartments fell away on their left. The mist swirled thickly, as if it sprang from the grass in the open area there. A few trees grew near enough streetlamps to be seen. "What is this place?" Hugo said.

Bowman rested a hand on his pistol. "It's Jefferson Square," he answered. "In the daytime, people get up on soapboxes and make speeches here. Nights like this, the punks come out." He peered warily into the fog until they left the square behind. Then, more happily, he said, "All right, three-four blocks to go."

He turned right on Fillmore, then left into an alley in back of buildings

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that fronted on Eddy. The alley had no lights. Gravel scrunched under the soles of his shoes.

"I don't trust him," Nicholas Alexandria said suddenly. "This is a place for treachery."

"Shut up, dammit," Bowman said. "You make me mess up and you'll get all the treachery you ever wanted." He walked with his left hand extended. Like a blind man, he brushed the bricks of the buildings with his fingertips to guide himself. "Stinking fog. Hell of a lot easier to find this place this afternoon," he muttered, but grunted a moment later. "Here we are. These are stairs. Come on, everybody up."

The stairway and handrail were made of wood. They led to a second-floor landing. The door there wore a stout lock. Gideon Schlechtman felt of it. "I presume you have some way to surmount this difficulty?" he asked Bowman.

"Nah, we're all going to stand around here and wait for the Sun to come up." Bowman pulled a small leather case from his inside jacket pocket. "Move. I've got picks." He worked for a few minutes, whistling softly and tunelessly between his teeth. The lock clicked. He pulled it from the hasp and laid it on the boards of the landing. He opened the door. "Let's go."

Bowman waited for his comrades to enter first. When he went in, he closed the door. It was no darker inside than out. The air was different, though: drier, warmer, charged with a thick odor not far from that of horse droppings. Again, he ran his hand along the wall. His fingers found a light switch. He flicked it.

Several bare bulbs strung on a wire across the warehouse ceiling sprang to life. He pointed from the walkway on which he and the others stood down to the immense gray-brown beast occupying the floor of the warehouse proper. Its huge ears twitched at the light. Its trunk curled. It made a complaining noise: the sound of a trumpet whose spit valve has not worked for years. "There it is, right off la Tórtola." Bowman stood tall. "The Maltese Elephant."

Gina Tellini, Schlechtman, Nicholas Alexandria, and Hugo stared down at the elephant. Then their eyes swung to Bowman. The same expression filled all their faces. Hugo drew his pistol. He pointed it at the detective. "He's mine now," he said happily.

"No, mine." The chromium-plated automatic was in Nicholas Alexandria's right hand.

Gina Tellini fumbled in her handbag. "No, he's mine." She, too, proved to carry a small automatic, though hers was not chromed.

"I am sorry, but I must insist on the privilege." Gideon Schlechtman had worn a .357 magnum in a shoulder holster. His stance was like an army gunnery sergeant's, left hand supporting right wrist. The pistol was pointed at a spot an inch and a half above the bridge of Bowman's nose.

Bowman stared down the barrel of the gun. His eyes crossed slightly. His right hand stayed well away from the gun at his belt. "What the hell is the matter with you people?" he demanded. "I find your damned ele-

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phant, and this is the thanks I get?"

"Let's all fill him full of holes, boss," Hugo said. His fingered tightened on the trigger.

"No, wait," Schlechtman said. "I want him to die knowing what an ignorant idiot he is. Otherwise he would not understand how richly he deserves it."

"This stupid ox? It is a waste of time," Nicholas Alexandria said.

"Possibly, but we have time to waste," Gideon Schlechtman replied. "Mr. Bowman, that great lumpish creature down there—in that it bears a remarkable resemblance to you, eh?—is an elephant, but not a Maltese Elephant, not *the* Maltese Elephant we have sought so long and hard."

"How do you know?" Bowman said. "An elephant is an elephant, right?"

"An elephant is an elephant—wrong," Schlechtman answered. "A Maltese Elephant is easily distinguished from that gross specimen by the simple fact that a grown bull is slightly smaller than a Shetland pony."

"Yeah, and rain makes applesauce," Bowman said with a scornful laugh. "Go peddle your papers."

"The old saw about he who laughs last would seem not to apply in your case, Mr. Bowman," Schlechtman said. "I spoke nothing but the truth. For time immemorial, Malta has been the home of a rare race of dwarf elephants. And why not? Before man came, the island knew no large predators. An elephant there had no need to be huge to protect itself. Natural selection would also have favored small size because the forage on Malta has always been less than abundant; smaller beasts need smaller amounts of food. The Maltese and their later conquerors preserved the race down to the present as an emblem of their uniqueness—and you tried to fob off this great, ugly creature on us? Fool!"

The elephant trumpeted. The noise was deafening. The beast took a couple of steps. The walkway trembled, as if at an earthquake. Nicholas Alexandria nearly lost his balance. Almost involuntarily, Gina Tellini and Hugo glanced toward the elephant for an instant. Even Gideon Schlechtman's expression of supreme concentration wavered for a moment.

Bowman jerked out his .45 in a motion quicker than conscious thought. "Come on," he snarled. "Who's first? By God, I'll nail the first one who plugs me—and if you don't shoot straight, I'll take out two or three of you before I go."

The tableau held for perhaps three heartbeats. The elephant trumpeted again. The door to the warehouse opened. "Drop the guns!" Detective Roland Dwyer shouted. His own pistol covered the group impartially. Behind him came Henry Bock, and behind him two men in uniform. All were armed. "Drop 'em!" Dwyer repeated. "Hands high!"

Nicholas Alexandria let his little automatic fall. It clattered on the walkway. Then Hugo threw down his gun. So did Gina Tellini. At last, with a shrug, Gideon Schlechtman surrendered.

Bowman stepped back against the wall, the heavy pistol still in his hand.

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Captain Henry Bock might have had something to say about that. Before he could speak, Dwyer asked Bowman, "Just what the hell is going on here, Miles?"

Bowman pointed to Gina Tellini and said: "She's the one who fingered Wellnhofer. Had to be: I visited the docks right after I saw her, and I had the list of ships I was going to check in my trouser pocket then."

"How'd she have a chance to find out what was in your trouser pocket without you knowing it?" Bock demanded, leering.

"You said you loved me," Gina Tellini hissed.

"Loved you?" Bowman shook his head. "You must have heard wrong, sweetheart. I'm a married man." He went on talking to Detective Dwyer: "She may have fingered Tom for that Evan Thursday item, too. I don't know that for a fact, but you knew Tom. He wouldn't have been easy to take down, not unless somebody recognized him who wasn't supposed to. Or she may have shot him herself. Tom would go after anything in a skirt."

"Yeah," Dwyer said. One of the uniformed policemen behind him nodded.

"I figure laughing boy here probably canceled Wellnhofer's stamp." Bowman jerked a thumb at Hugo. "Gina and Schlechtman knew each other pretty well, and Hugo's Schlechtman's hired gun."

"So who did Thursday?" Roland Dwyer asked.

"Could have been Hugo again," Bowman answered, shrugging. "Or it could have been sweetheart here" —he grinned at Nicholas Alexandria, who returned a hate-filled glare— "on account of I'm not sure if Hugo was in town yet."

Dwyer pointed to Gideon Schlechtman. "What about him?"

"The hell with it," Captain Bock said. "He's in it some kind of way. We'll take 'em all in and sort it out later." He gestured to the uniformed policemen. They advanced with their handcuffs. The one who cuffed Gina Tellini shoved her lightly in the middle of the back. She stumbled out of the warehouse. The others glumly followed.

"You almost got too cute for your own good, Miles," Detective Dwyer said. "If that witness hadn't heard Wellnhofer spill to you—and if he hadn't decided to tell us about it—you wouldn't have had yourself a whole lot of fun, didn't look like." He stared down at the elephant. It pulled hay from a bale with its trunk and stuffed it into his mouth. "What the devil were you doing here, anyway?"

"Who, me?" Bowman replaced his Colt in its holster. "I was just on a wild elephant chase, Rollie, that's all."

"Yeah?" Dwyer's eyes swung to the door through which Gina Tellini had just gone. "You going to tell Eva all about it?"

"I'll tell her what she needs to know: I got paid."

Dwyer shook his head. "You're a louse, Miles."

"That's what everybody tells me." Miles Bowman laughed. "Thanks," he said. ■

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BIOLOG Jay Kay Klein

Analog has been created by a lot of people in over two-thirds of a century. Some contributed for many years and some, like Kent Patterson, for just a few.

Kent's first two college years were spent as a physics major. His BA and MA were in English lit at Brigham Young University. A Ph.D. in 19th Century American Literature came from the University of Kentucky. Childhood polio struck ten years before Salk and Sabin vaccines became available. He overcame nearly complete paralysis to get about on crutches and catch up with his age group. He started full-time writing after his teaching job at an Eastern college was downsized out of existence. Postpolio syndrome struck a few years ago so that crutches became supplemented by powered scooter.

Photo by Nina Kiriki Hoffman

Kent Patterson

Born in Idaho, he grew up there, in California, and in Tennesee. Later, he resided in Utah, Texas, Kentucky, and New Jersey, finally settling down in 1973 around Eugene, OR. Reading meant a great deal to him, much of it what less discerning minds call "escapist," but which science fiction readers know is really mind-stretching imagineering. A first *Analog* story appeared in the March, 1991 issue.

For years, he would write an occasional story, and see it rejected. Then he joined the Eugene Professional Writers Group, where Dean Wesley Smith and Kristine Kathryn Rusch cracked the whip. Kent worked hard under the lash, writing fiction day after day, workshopping, rewriting, and re-rewriting. He found that ideas come easily, but turning them into stories takes work.

Kent felt that the first wonderful thing about writing is that there are few restrictions on the imagination. The second wonderful thing is that you meet so many smart and interesting people. Using a laptop, he wrote sitting in a park where he could see

(Continued on page 174)

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THE REFERENCE LIBRARY Tom Easton

Terminal Cafe, Ian McDonald, Bantam, $12.95, 277 pp. (ISBN: 0-553-37416-8).
Cyberweb, Lisa Mason, Avon, $20, 262 pp. (ISBN: 0-688-13987-6).
The Diamond Age, Neal Stephenson, Bantam, $22.95, 455 pp. (ISBN: 0-553-09609-5).
Caliban's Hour, Tad Williams, Harper Prism, $14.99, 201 pp. (ISBN: 0-06-105204-3).
Georgia on My Mind and Other Stories, Charles Sheffield, TOR, $21.95, 349 pp. (ISBN: 0-312-85663-6).
The Vertical Fruit of the Horizontal Tree, Howard V. Hendrix, Talisman (P. O. Box 321, Beech Grove, IN 46107), $5.95, 51 pp. (ISBN: 0-9626708-6-3).
Science Fiction in the 20th Century, Edward James, Oxford University Press (Opus), $11.95, 250 + xiv pp. (ISBN: 0-19-289244-4).

In much of the commercial world, ideas are protected as jealously as babies. This is why we have such a thing as patent law, which permits inventors to stake a claim not only for a specific invention, but also for future variations on the invention, even ones that use a similar approach to solving whatever problem the first inventor solved. Trademark law is almost as protective; as I understand it (and I am *not* a lawyer), purple arches and golden triangles would be frowned upon, especially if they were the trademarks for fast-food emporia, but purple triangles might not be.

Copyright law is a little less stringent, protecting only specific expressions of an idea. That is, two writers could each write descriptions of Newt Gingrich, but the second had better not use the first one's phrases and sentences. Fiction writers had better not swipe each other's characters.

That's about as much as non-SF writers have to worry about. The gadgets and destinations and maguffins they write about are all part of the real world; in a very real sense, these writers are writing "shared-world" stories in which all the furniture is common property.

Perhaps it is not surprising that SF writers tend to share as well. They don't tend to borrow all the furniture unless there is some sort of formal agreement, as in "shared world" anthologies and series. That is, Joe Haldeman isn't about to take over Edgar

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Rice Burroughs's Barsoom. But they do visit the lumber room and pick out a few choice bits. Red, blue, and green-skinned maidens have emerged from many more typewriters and word-processors than Burroughs's, as have six-legged riding beasts called everything but thoats. Blasters and warp drives are all but omnipresent.

If SF writers were inventors, this could not happen—the lawyers would see to that. But they are writers. There is a sort of gentle (wo)man's agreement to the effect of: "You like that bit? Go ahead, use it, I'll be interested in seeing what *you* do with it. But mind your manners there! Don't take too much. Don't be a pig."

Where am I going with this? I have no intention of accusing anyone of being piggish in their borrowing. After all, readers are so used to seeing the same furniture show up in livingroom after livingroom that they're used to it. It's taken largely for granted, it's really quite traditional, and what's all the fuss about anyway?

Yet occasionally a book does strike one as being a mite *obvious* in its borrowings. This occurs when the material being borrowed is still new, as happened after William Gibson's *Neuromancer* appeared and cyberpunk was suddenly everywhere. It can also occur when one book reminds one strongly of another, and then the next book one picks up is a sequel to that other.

For me, the reminder book was Ian McDonald's **Terminal Cafe**, which is built on the idea that one of the first things nanotechnology will give us is immortality. That is, properly designed nanobeasties will be able to rebuild dead bodies, restore consciousness, and revivify. Of course, this has to play hob with society's traditions of inheritance and the like, so society chooses to define the revived dead as nonhuman, nonpeople, having no official existence, yet still valuable as slaves and consumers. Thus ghettoes too are revived; in the tradition of underclass neighborhoods, these "necrovilles" become centers of cultural innovation (death is temporary, so what better sport can there be than the Wild Hunt hybridized with Odin's Valhalla, die and rise to hunt and die again, turn and turn about) and Carnival, centered of course on the Day of the Dead, not Mardi Gras. Thus also is there the rebellion of the slaves, the Freedead who have been put to work in the mines of the asteroid belt and Moon; they have thrown off their masters, and they are bringing the rebellion home to Earth to free the rest of the dead and give them the stars and Look! There in the sky! It's . . . !

This feast of inventive genius, this primo candidate for future borrowings galore, *this* is the setting wherein Santiago Columbar, drug designer extraordinaire, finds ennui rather too much and decides to seek an ultimate trip in the local necroville. On November 1, All Saints' Day, the Day of the Dead, he will give himself to death. Invitations to witness the event go out to four friends: ex-lover Trinidad; Toussaint, heir to the master of the corporation that has cured death, a seeker of excitement in his own way, redesigned to fly high, high beneath the Sun; Camaguey Quin-

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tana, builder of nanotech reefs, doomed by a nanotech plague to just a few more hours of life; and Yo Yo Tok, a lawyer whose court is cyberspace and whose career is threatened by a cyberspace creature disguised as fruit-hatted Carmen Miranda. The story of *Terminal Cafe* is their story, the convergence of their backgrounds and problems in a single moment that must give all of human destiny a new direction.

Most of McDonald's characters are warped and to a degree unpleasant. But I liked Yo Yo (Hey, that's what we used to call my daughter, Joellen). She's spunky, on the prod, struggling for control of her life, and a rather more worthy hero for the story than Santiago, which brings us to the tale's deepest flaw. McDonald gives each character by turns so much attention that the tale does not feel well focused. Santiago is the hero only because he sends out invitations. The true center is . . . Yo Yo? Camaguey? Toussaint? Any of the three would serve better, though perhaps Toussaint would be the most effective center, since his is the fate that eventually resolves the social conflicts that drive his world's frenetic pace.

Yo Yo is also the most prominent of several reminders of other writers' work. Just think—lawyer, cyberspace court, cyberbeasty pest. What springs to mind but Lisa Mason's *Arachne,* whose heroine Carly Nolan got into trouble because a spider interfered with her work?

A spider? Carmen Miranda? Great big bunches of fruit from which tropical arachnidae, big hairy tarantulas, emerge? McDonald couldn't be that cute. Could he?

Since the very next book I picked up was Lisa Mason's **Cyberweb,** sequel to *Arachne,* McDonald's borrowing seemed to me quite obvious. Here is Carly Nolan once more, still a gene-tweaked lovely lawyer but down and out, barred like Yo Yo from her career, banished to the low-life district, accompanied only by the robot, Pr. Spinner, pursued by abo tribesmen who live in abandoned barges and raid dumpsters for third-hand food, propositioned by a strange artificial intelligence, Cognatus, who wants her to carry out special missions. And oh, yes, by the way, here's a wad of money, enough to get you back on your feet, my dear, and it's not traceable so the AIs out to get you can't.

In *Arachne,* Carly found that rogue AIs covet fragments of the human psyche known as archetypes (not all humans have them) and are willing to steal them, thus vegetabilizing or killing their proper possessors. She also discovered that she had an archetype of her own, the spider, a very useful extension of her powers if only she could learn to make it do her bidding. She and Pr. Spinner have been trying to learn the trick, but without much success. Fortunately, when she hies off on Cognatus's missions—tracking and recovering stolen archetypes—and lands in sudden jams, she gets the hang of it.

She is now empowered with all she needs to become a cyberspace superhero, and the tale ends with hints

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that this is Mason's scheme. Why, the spider-like Pr. Spinner even gets a nifty new and sexy bod quite the match for Carly's own, and the pair who take the final bow—gleaming metal hand in hand with glowing flesh—offer intriguing possibilities.

Neal Stephenson's new SF novel, **The Diamond Age,** is a tour-de-force of nanotech imagination pushed to the point of Vingeian singularity. The key is the idea that "to compute" means "to exchange information." This is true for the simplest of Turing machines, writing their ones and zeros on their infinite tape. It is also true for today's computers and for people, even for people inhabited by swarms of nanotech beasties (he calls them mites) and inhabiting a vast network of interconnecting tunnels under the sea.

In Stephenson's future, the world's nations have been replaced by a great many race, ethnicity, religion, ideology, and style-based phyles or tribes. Members of a phyle tend to live in the same building or neighborhood but may also be quite scattered. The richest phyles, such as the neo-Victorians, use nanotechnology to grow themselves whole islands as well as clothes, buildings, airships, and even food. The poorer ones rely on it mostly for food and clothing. Everywhere, "matter-compilers" or MC's, are hooked to Feeds, the pipelines that deliver the purified elements necessary for making whatever people request. Nanotechnological engineers prepare the programs the MC's use to make new things. And of course, the Powers That Be are quite fond of the status quo and take considerable care to discourage the next, Feed-free stage in the development of nanotechnology.

John Percival Hackworth is a brilliant nanotech engineer. He is also a neo-Victorian who dreams of seeing his daughter rise higher in the social hierarchy than he himself can dream of. At the birthday party for Princess Charlotte—for which a diamond-framed island full of unicorns and other marvels has been grown from the floor of the China Sea—he encounters Lord Finkle-McGraw, who wishes to add a subversive element to his own daughter's education. Before long, Hackworth is constructing a new nanotech marvel, an interactive storybook, *A Young Lady's Illustrated Primer,* designed to teach a child to think for herself. He is also coveting it for his own daughter.

Needless to say he manages to bootleg a copy. Unfortunately, he is mugged on the street, and the *Primer* falls into the hands of Nell, a lower-class girl, the victim of neglect and abuse. One promptly expects the interaction of *Primer* and Nell to produce a remarkably independent, tough-minded, capable woman.

But Hackworth has made himself vulnerable by his straying from propriety. Soon he is conspiring to assist Dr. X, a Chinese mandarin, an underworld leader, a nanotech whiz himself, in making thousands of additional copies of the *Primer* for the benefit of a horde of girls rescued from infanticidal parents in the Chinese hinterland. Caught by the neo-

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Victorian cops, he is turned into a double-agent, and then Dr. X sends him off to join the undersea Drummers, who exchange nanomites in endless orgies, thereby sharing thoughts —information, mind you—and relentlessly compute toward some unguessed goal.

Meanwhile, Nell is growing up. We see how thoroughly nanotech has reshaped our familiar world, and how certain themes—class distinctions, for a prominent instance—remain. We watch her climb the mountain of her island, both physical and social, moving up in the world, gaining poise, confidence, a sense of destiny. We see others as well, and Stephenson underlines again and again that he has set his tale off the Chinese coast as a powerful echo of British imperial colonialism, Hong Kong and Shanghai redux. It is no great surprise to see a new Boxer rebellion taking shape, the countryside in flames, a tide of slaughter sweeping toward the nanotech towers even as Hackworth and the Drummers prepare the seed of a new age.

Stephenson has filled his tale with a thousand telling details. His world is densely realized, convincing, and Hackworth's mission, the ultimate goal of all that computing, is a high one indeed, one that will reshape the world once more by helping to raise the lower classes to a Confucian primacy. If there is a problem with the novel, it is the lack of sharp focus due partly to the way the wealth of details swamps the reader's sense of direction, partly to the way the attention he pays to Nell's interactive storybook deflects the focus much as water deflects (refracts) vision, and partly to the way years-long gaps in the story (necessary to fit so much in a single book) make many developments feel rather arbitrary.

However, the tale's merits are vastly greater than its flaws. *The Diamond Age* is well worth your attention.

Tad Williams, author of *Tailchaser's Song* and *To Green Angel Tower,* escapes the bounds of conventional fantasy with **Caliban's Hour.** He has chosen to look at Shakespeare's *The Tempest*—which ended when Prospero and his daughter Miranda escaped their deserted isle, leaving it to the sole possession of the beast-man Caliban—and to ask, "Then what?"

For Miranda, what ensued was marriage and children and life as comfortable upper-crust prosperity, and now a daughter who refuses a comfortably arranged marriage and craves adventure such as her mother once knew. For Caliban, bitter rue was his portion, until he managed to stow away on a ship and make his way toward Naples, a rough beast slouching toward an appointment with. . . . Watch the shadow skulking, lurking, avoiding watchmen, slipping through doors into Miranda's very own bedchamber, a rough hand clapped over her mouth, a voice hissing, "Silence! Listen! While I tell you what it was like to be raised by a speechless witch, to be an animal to whom that island was a heaven, to face mother's death and loneliness and then the coming of strangers, mysterious Pros-

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pero with his tricks and his cursed gift of speech and reason, and dear Miranda, sweet Miranda, playmate, friend, once nearly lover. Untouchable Miranda, spurning me, permitting her father's abuse. Listen! For just this hour, while I tell all and finally kill you."

The single hour of the tale stretches from eleven of the night to nearly dawn, and it makes clear that Caliban had a history to make him what he was. He has hurts to treasure, reasons for hate. Speech and reason were indeed curses to him, or were they? After all, they gave him pain and discomfort, but they also gave him the ability to tell this tale, to recapture moments of joy as well as pain. Hate and love are mingled in him as they are in most of us, and it is language—tale—that lets us know it.

Williams has done a marvelous job of bringing Caliban to life for modern readers. The only flaw is the end, for it was predictable as soon as he introduced us to Miranda's daughter. It also comes far too easily to convince. Yet this flaw is not major; the tale remains strong and warm and deeply felt, a charmer that should appeal to fans of both Shakespeare and fantasy.

Charles Sheffield is at the top of his form in the stories collected in **Georgia on My Mind and Other Stories.** The title story, from these pages, won both Nebula and Hugo and needs no further comment. "The Feynman Saltation" is a warm, loving look at the death from brain cancer of a man whose memory "counts down" by recapitulating not his personal ontogeny but the full phylogeny of the biosphere. "The Bee's Kiss" deals with a future tyrant who sentences those who offend him—such as a certain highly skilled voyeur—to serve him under threat of annihilation; the voyeur finds a unique application of his talents, escape, and love. "Deep Safari" (nanotech adventure in a woman's body) and "Golden Road" (almost straight historical) also involve love, while "Destroyer of Worlds" (on the hazardous possibilities of ecological strange attractors) and "Trapalanda" (on the search for and discovery of a mysterious energy source in the Patagonian mountains) are more philosophical. Almost every story is based firmly enough in science and technology to satisfy the most demanding hard-SF fan, while there is also enough human depth and concern to soften the harder edges. As I've said before, Sheffield sits comfortably on the same shelf as Heinlein, Asimov, and other classics.

Howard V. Hendrix's **The Vertical Fruit of the Horizontal Tree** is a curiously arch novella. Its style, tone, and content all echo a time when one could discover lost races in the jungles of distant, unexplored lands, and with them marvels. Here the explorer is a graduate student who is rather too fond of mind-altering drugs, which is perhaps what prompted him to go into ethnobotany. Now he has disappeared, and his brother must track him to a South American tepui (tepuis are steep-sided mountains whose flat, cloud-shrouded tops shelter many unique species; they have not been

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well explored to this day) where on an earlier journey he had found a strange tribe and novel mushrooms. Now he has blown his grant money on assorted high-tech gear, shlepped it to the tepui's top, and. . . .

It is perhaps enough to say that an earlier, shorter version appeared in a 1991 magazine as "Singing the Mountain to the Stars," and it still isn't very convincing. On the other hand, Hendrix has a deft enough touch with image and phrase to be pleasing even when he isn't convincing.

Science fiction began before this century, but it undeniably flourished as never before in the twentieth century. It is thus largely a phenomenon of our time, of contemporary culture, and it must be understood in that light.

Many scholars and critics—not to mention university departments of popular or contemporary culture—have endeavored to do so. The latest is Edward James, whose **Science Fiction in the 20th Century** "is an introduction to science fiction . . . intended primarily for those who know little about it. It attempts to be as much a cultural history as a literary history. . . . [It includes] a brief discussion of the origins of sf, . . . reckoning the twentieth century to begin in 1895 with H. G. Wells's *The Time Machine*. . . . One of its constant concerns is the difference between sf in the United States and in the rest of the world. . . . The main underlying thesis of the book is that sf is a major cultural phenomenon, an understanding of which is essential if one wants to comprehend the ways in which Western societies have come to terms with the rapid change and uncertainty which have characterized our century" [from the Preface].

Does James succeed in his effort? He offers few unique insights, preferring to draw upon the work of other scholars to assemble something of a consensus view of SF's position. This is perhaps due to his professional orientation; he is neither SF writer nor literary nabob but an early medievalist, a line pretty well limited to secondary sources. Unfortunately, such sources can lead one astray, as when he discusses the sense of wonder, quoting with apparent approval a number of scholars who say its essence is a sense of awe and horror, or of the "Sublime: a feeling of helplessness and terror when humans realize their frailty and small size in the face of the might and magnitude of the universe" [p. 104].

Yes, I suppose there are a great many Shrinking Sallies and Nattering Nellies and Horrified Herbies out there, folks who cannot deal with ultimate realities, folks who wish the universe would go away and leave them alone and comfy by the parlor fire. But I don't think that is what an *Analog* reader means when he or she thinks of sense of wonder. It isn't just Gosh-Wow, either, but perhaps more the feeling that washes over a gourmand faced with a spread of seventeen kinds of pie. It's joy, isn't it? Joy and the urge to embrace it all and the confidence that we *can* embrace it and even a bit of greed for all the new and all the excitement and all the ad-

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venture awaiting us. It's a very positive, expansive feeling, which James completely misses in favor of something more in keeping with the timidity the west has developed in the last few decades.

Is mine—I think, *ours*—a minority view? Well, the rest of SF *has* turned inward, repeating old themes, reworking familiar ground (trilogorrhea, sharecropping, movies that redo 1930ish space opera in pretty pictures). Fantasy has come to dominate the bookstore shelves. Comfy is in.

James recognizes that and is unhappy enough about it to say there is hope: "[SF] as a literary medium is still engaged with developments in modern science and technology; it still offers serious speculation about the future; it is still a place for satire" [p. 208].

But I don't think he sees it as a place for joy in the face of the Universe. He just doesn't get that aspect of SF. ■

They also say that every time a star blinks it makes a difference to each of us, so powerful are the laws of cause and effect... it may make a difference to you.

—Will Cuppy

Nature abhors smugness.

—Kelvin Throop

Let us live so that when we die even the undertaker will be sorry.

—George Bernard Shaw

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BRASS TACKS

Dear Mr. Schmidt:

The December issue was great. I've been reading science fiction for almost 70 years and have appreciated the great writers like Heinlein and Asimov. But as society has changed so has the world-view of the writers. Heinlein's influence is becoming dominant: "Evolution," by Grey Rollins, is an outstanding story both for its science extrapolation and its social outlook, and I am enthusiastic about it and believe that RAH would have applauded.

The Probability Zero short brought to mind the "Cold Equations" by Tom Godwin, August 1954. It is well that most of your readers (people under 50) should see another variation of the same theme.

Anyway, keep up the good work. I look forward to every issue.

RAPHAEL G. KAZMANN

Baton Rouge, LA

Dear Mr. Schmidt:

In "Evolution," once again the Good Lunar Capitalists triumph over the Wicked Lazy Bums on Earth (Dec. '94). This is getting tiresome. True, doing what the Earth folks want would ruin Luna; true, one must provide incentive to work if one wants people to work; true, Earth is populated with the sort of lazy bums that we have only too many of in the real world. However, this hardly justifies the sanctimoniousness of the Lunar folk. One's perfection is not proven by one's opponent's being worse than one is.

"Earth, North America in particular, chose the course they are on." Ha. Many of the people he was talking about weren't *born* when the choices were made. Why should the sons, even to the third and fourth generation, jump up and down with glee at the prospect of paying for the sins of their fathers? (They will have to, because someone will have to, but to observe that it wasn't their fault is the simple truth.) Why is it that the instant one concedes that personal decisions have an influence in one's results, one instantly loses the ability to see that it isn't *all* personal decision, one can be a victim of circumstance?

One thing the story got completely right: all the Lunar folks think they and the Earth folks got to their place through their personal decisions, and all the Earth folks

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think it was all luck. This is a result of their respective success and failure, not a cause; even in card games, people credit themselves for their successes, and blame their circumstances for their failures. (Though I'm still tracking down the experiment where this finding came up.)

MARY CATELLI

Poughkeepsie, NY

Dear Stan,

I had a thought that I wanted to share with you concerning your editorial on "default options" for lifestyles (Dec. '94). It seems to me that just such a default as you describe used to be fairly common back in the days when nuclear families and family businesses were popular. Children were expected to follow in their parents' footsteps unless they had an opportunity to do something better. Women had far fewer options than men, and the definition of "better" caused quite a bit of argument among families, to the point where the "default" trade became mandatory in many cases, but it was nonetheless a default.

The nice thing about that system was that it provided new workers for practically every job. There wasn't just one default option for everyone; there were millions of different defaults for millions of different people, depending on what family—and what family business—they happened to be born into.

The downside to the system was its lack of flexibility. The pressure to stay in the family business forced a lot of people to accept the default when they didn't want to, but worse, many children never even realized there was an option. The family-oriented default lifestyle system is far from dead; we still see it in action here in Oregon, where some high school kids, when asked what they want to do with their lives, say they want to be loggers. Never mind that it's a dying profession; their grandaddies were loggers and their daddies were loggers, so that's what they're going to be, too.

As you said in your editorial, there's got to be a better system; one that provides options without pressure. Only then would we have the flexibility as well as the security provided by default choices. The sooner we develop the system, the better. Right now the default for many people seems to be unemployment and welfare, which doesn't seem to be good for the people who find themselves trapped there, nor for society as a whole.

JERRY OLTION

Dear Mr. Schmidt,

I've read *Analog* almost as long as I can remember and that's a long time. The editorials have always been most interesting; even when I didn't agree with them, they made me think.

The editorial in the December, 1994 *Analog* was one I didn't have to think about. It's the way I live. I've been a housewife for many

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years. Or at least that's the way I describe myself when someone says, "And what do you do?" Actually, I was a Girl Scout Leader, Sunday School teacher, Radio Announcer (in the days before women "did that sort of thing"), and am now a Reserve Deputy for the Pittsburgh County Sheriff's Department and an Armed Security Guard, among many other things. But what I really do is housewife.

In other words (with apologies to Shakespeare and to you):

Default, Dear Stan, is not in our stars,

But in ourselves, that we are underlings!

Now by underlings I don't want to infer any inferiority. I think of underlings as those who stand under everything else and keep it orderly and moving smoothly. Isn't that what the art of Housewifery is all about? It's a most noble calling and I'm glad to have the opportunity to practice it!

JOANNE ATKERSON

McAlester, OK

Dear Editors:

In your December editorial you made a strong suggestion that men and women freely choose careers that suit them personally. Unfortunately, the kind of society that permits this is doomed by demographics: career women average fewer than two children, far below the replacement birthrate. Therefore such a society is not stable: evolution is inevitable.

If the population deficit is met by immigration, free career choice in the society can be maintained, but the ethnic and racial mix will be greatly altered, depending on which country has excess population to export. This solution appears to be involuntarily adopted by the US; bright young people from all over the world come here to do what they can do best, for the benefit of themselves and for their adopted country.

Closing the borders to preserve the ethnic composition will be a fatal decision. If there is no immigration, the population of women who opt for childbearing over careers will increase, simply because they traditionally have more children. Eventually the free-choice culture will be overwhelmed by the breeders, turning the originally prosperous country into a poor, male-dominated "third world" society.

There seem to be no static solutions to the dilemma of demographic survival vs. free career choice, only ever-changing dynamic ones. As the old saw goes: "The price of freedom is eternal vigilance."

ANDREJS BAIDINS

Wilmington, DE

Dear Mr. Schmidt,

I just finished reading the letter from Melanie M. Rodden, (Brass Tacks, December 1994) and your reply. I thought the following information might be useful to both of you so I'm sending you both a copy of this. I like the new policy concerning mailing addresses, by the way.

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Here in Montrose Township we have two sanitary landfills. Landfills produce methane gas as a result of bacterial action and the fill operators have drilled shallow wells to vent the gas which is then used to generate electricity. Total capacity is only 3.5 megawatts but the land fill can be expected to produce methane for 20 years or so.

There is a small electric generating plant intended to burn scrap wood under construction about 20 miles from here which should be in operation by next spring. I have no idea what the capacity will be but the fuel will be used pallets and shipping crates from the industrial plants in the area.

Finally, pellet stoves are becoming more popular here. If you are not familiar with them, a pellet stove is a wood burning heating stove which burns pelletized fuel. The pellets are made with the same machinery used to make animal feed and may be made from recycled paper or wood. Cost is competitive with anthracite coal or fuel oil and the pellets burn cleaner than either of the more traditional fuels.

JAMES C. RITTER, JR.
Montrose, MI

Dear Dr. Schmidt:

In response to Melanie M. Rodden's letter in the December issue, several waste-to-energy electric power plants are in operation in the U.S. The largest, near Detroit, processes more than 3,000 tons of municipal waste per day. However such plants are not efficient and cost far more to design and build than comparable plants burning fossil fuels.

Some plants process the municipal waste before burning, removing non-combustibles like glass and metal and chopping the waste into more uniform-sized chunks before burning. This refuse derived fuel (RDF) has a higher heat content, which allows the plant to operate more economically, but electricity generated by these plants still costs far more per megawatt than fossil-fueled plants. Oddly, cities with strong curbside recycling programs are the least likely to build such plants, since much of the combustible newsprint has been removed from the fuel stream. As a result, waste-to-energy plants are seldom built as a way to generate electricity. One plant in Connecticut cofires pulverized coal with RDF to ensure a higher, more uniform heat content; however, the plant still is less efficient than a similar-sized plant 100 percent fueled by coal. A waste-to-energy plant's sole purpose is to reduce the amount of waste being landfilled. When landfill fees for dumping a truckload of waste are less than $40, generally it is more economical to landfill waste.

Plants that burn specific types of waste often make better economic sense. For instance, processing sugar from sugar cane leaves tons of *bagasse,* waste plant material. Power plants designed to burn this fuel cost less because waste does not have to be processed before

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use, fuel transportation costs are minimal, and the fuel is of uniform size and heat content. Most of the electricity and industrial process steam produced is used by the cane processing facility, also reducing transmission costs. A plant in Grayling, Michigan, burns sawdust and wood waste created from a nearby furniture plant and sells the generated electricity to the local utility. In England, a power plant generates more than 25 megawatts of electricity burning used tires. Other fuel sources include rice hulls, corn cobs, and cow manure.

Great progress has been made in the past decade in designing and building coal and natural gas fueled power plants that are cheaper, more efficient, and less polluting. Until waste-to-energy plants can match the competition, it is unlikely many more will be built.

LORRAINE GEHRING
Overland Park, KS ■

(Biolog continued from page 161)
out over a lake or river. Including the Pacific, he calculated it took him about 100,000 tons of water to turn out a story. Becoming a regularly selling SF writer was in his own mind the climax to his life. In one of the last things he wrote, he said, "I am doing exactly what I have always wanted to do. How lucky can I be?" Kent Patterson's final *Analog* story appears in this issue. ■

We welcome your letters, which should be sent to *Analog*, 1540 Broadway, New York, NY 10036. (CompuServe: 71154,662. Internet: 71154.662@compuserve.com.) Space and time make it impossible to print or answer all letters, but please include your mailing address even if you use e-mail. If you don't want your address printed, put it only in the heading of your letter; if you do want it printed, please put your address under your signature. We reserve the right to shorten and copy-edit letters.

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UPCOMING EVENTS Anthony Lewis

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MYTHOPOEIC CONFERENCE XXVI at Clark Kerr Campus, Berkeley, Calif. Guest of Honor—Tim Powers and Prof. Michael R. Collings. Theme: Fairies in the Garden, Monsters at the Mall: Fantasy in the World Around Us. Registration—$45. Info: Eric & Bonnie Rauscher, 2231 Tenth Street, Berkeley CA 94710.

29-31 July
CONFLUENCE '95 (Pittsburgh area SF conference) at Sheraton Hotel, MARS, Penna. Registration—$20 until 1 July, $25 thereafter. Info: ConFluence '95, Box 3681, Pittsburgh PA 15230-3681. (412) 344-0456.

11-13 August
BUBONICON 27 (New Mexico SF conference) at Howard Johnson East, Albuquerque N. Mex. Guest of Honor—Harry Turtledove, TM—Simon Hawke, Guest Artist—Martin Cameron, Media Artist Guest—Rick Sternbach. Registration (to NMSF)—$21 until 30 July, $25 at the door. Info: NMSF Conference, Box 37257, Albuquerque NM 87176. (505) 266-8905 (1100-2200 MT).

11-13 August
DIVERSICON 3 (Minneapolis area SF conference) at Minneapolis/St. Paul, Minn. Guest of Honor—L.A. Taylor. Registration—$25 until 15 July, $35 at the door. Info: Diversicon 3, Box 8036, Lake Street Station, Minneapolis MN 55408.

24-28 August
INTERSECTION (52rd World Science Fiction Convention) at Scottish Exhibition & Conference Centre, Glasgow, Scotland. Guests of Honour—Samuel R. Delany & Gerry Anderson, Fan Guest of Honour—Vin¢ Clarke, TMs—Peter Morwood & Diane Duane. Registration—£80/US$125/CDN$160/DM210/DFI 240, Supporting—£15/US$25/CDN$30/DM40/DFI 45. At-door rates not set as of the time of this listing but will be greater than current attending rates. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Intersection, AdMail 336, Glasgow G2 1BR, UK or intersection@smof.demon.co.uk; Intersection, Box 15430, Washington DC 20003-4030, USA. (301) 345-5186 voice/fax.

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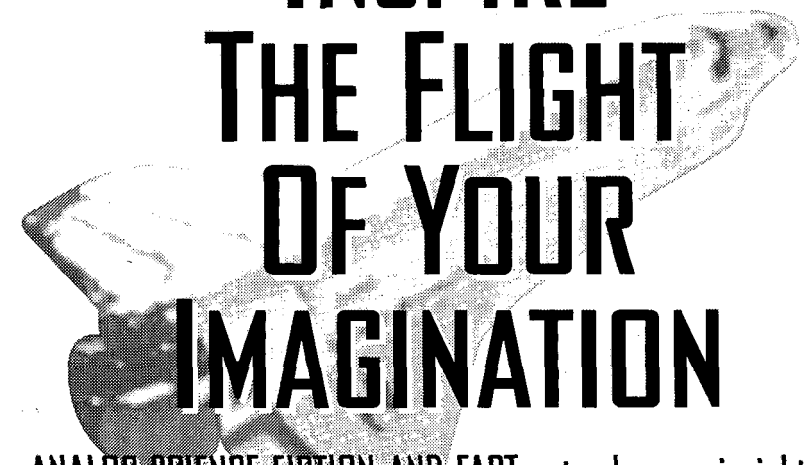

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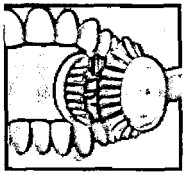

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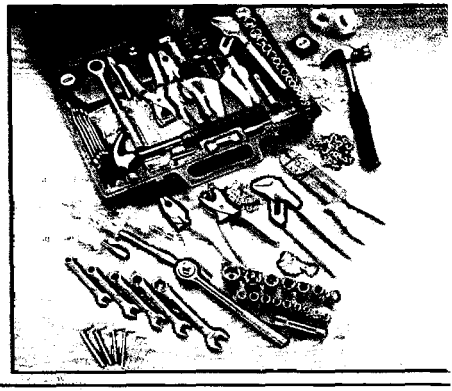

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